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THE FRENCH EXPERIENCE OF PANDEMIC INFLUENZA
DURING THE GREAT WAR

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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* * * * *

The Ohio State University
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ABSTRACT

The influenza pandemic that occurred during the first World war killed more people, and more quickly, than any other disease in history. By a conservative estimate, 25-40 million people died worldwide from August 1918 to January 1919. Yet despite the magnitude of the pandemic's death toll, little historical research has been undertaken on the subject. Historians have tended to avoid the study of influenza in favor of diseases such as plague, cholera, and smallpox, whose aetiologies are better understood; moreover, the historical research that has been conducted in this field tends to be strictly descriptive.

For a comprehensive account of the French experience of the pandemic during 1918-19, this study outlines the microbiology and epidemiology of influenza, offering a rationale for the importance of establishing connections among microbiology, evolutionary biology, and historical epidemiology to better comprehend the disease. An account of the French experience of the Spanish influenza follows. Issues for consideration include how government agencies pursued policies of quarantine or prevention, the therapies that local and national medical authorities experimented with and recommended, the public's acceptance of or resistance to these policies and therapies, and the disease's death rates by cohort.
Analyzing the preparedness of the French Army and the expeditionary forces of its allies for combating the 'flu, this project defines the measures undertaken to cope with the disease, and demonstrates that if France did no worse than any other European state in battling the Spanish 'flu, neither was France any more successful in its attempts to stem the tide or mitigate the effects of the disease.

The study also offers suggestions for further research into the peculiar behavior of the Spanish influenza during the war. For, despite its location at the epicenter of the disease, France managed to dodge the worst effects of the pandemic, suffering markedly fewer fatalities than other European nations. Offering the hypothesis that the movement of the French troops both increased the disease's virulence and served as the means for exporting it to other countries, the author recommends collaborative research between historians and biologists for further insights into the influenza pandemic and its migration patterns.
Dedicated to my son,
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CHAPTER 1

INTRODUCTION

By April 1918 France had been at war 44 months, and, despite the interment of the union sacrée with the formation of Clemenceau's ministry in November 1917, France had found at last its "patriotic war," burying, as many hoped, the legacy whereby "... she fought no war that was not, sooner or later, cross-bred with civil war."¹ But the toll of this effort had been extravagant. The French army had mobilized 7,322,000 men, the navy another 156,000; of these 1,486,000 were listed as killed in action, missing or taken prisoner by the close of 1917, and over two million had been evacuated for wounds or


The sacred union had been fostered by the smooth mobilization that took place between the 2nd and the 15th of August 1914 and the willingness of the authorities to set aside the "Carnet B," the list of socialists and other presumed subversives to be arrested upon the declaration of mobilization and a state of siege (the latter was decreed on 2 August and affirmed in the law of 5 August). For an evocative account of the July crisis and the August mobilization, see Richard Cobb, "France and the Coming of the War," in R. J. W. Evans and Hartmut Pogge von Strandmann, eds., The Coming of the First World War. (Oxford: Clarendon Press, 1990), pp. 125-44. The policy of national unity was confirmed in René Viviani's Ministry (26 August 1914-29 October 1915), a Ministry that included the socialists Marcel Sembat as Minister of Public Works and Jules Guesde as Minister without portfolio.
sickness. Over 32,000 square kilometers of the ten northeasternmost departments that lay along the invasion route of 1914 had been overrun, producing a tide of refugees that would reach 1.6 million by September 1918. The occupation deprived France of more than 80% of its iron ore and cast iron production, three-quarters of its coal reserve and over 60 per cent of its steel-making capacity. And, with the retirement of the German occupation, France mobilized 8,660,000 men (80.5% of those eligible—only Serbia mobilized a greater proportion of its men), of whom 1,100,100 died, 263,500 were declared missing and presumed dead, 508,000 taken prisoner, and 3,110,000 evacuated for wounds or sickness. See Ibid., pp. 97-103, 416-19. Ferro cites different figures—2,636,000 casualties through the end of 1917—but provides no source. See his *The Great War, 1914-1918*, p. 127. The *Histoire de la population française* gives precisely the same figure as Huber. See Jacques Dupâquier, *et al., Histoire de la population française*. Volume 4: *De 1914 à nos jours* (Paris: Presses Universitaires de France, 1988), p. 54. These figures, of course, include casualties from all theaters of operations, but this study, as it details the peculiar passage of the Spanish 'flu through France, will concentrate exclusively on the western front.

3 See Huber, *La population de la France pendant la guerre*, p. 181. Most of these refugees were French, but almost 150,000 Belgians are included in Huber's figures.

4 John F. Godfrey, *Capitalism at War: Industrial Policy and Bureaucracy in France, 1914-1918*. (Leamington Spa: Berg, 1987), p. 47. B. R. Mitchell, in his *International Historical Statistics: Europe, 1750-1988*. (New York: Stockton Press, 1992), pp. 442,457, gives more dramatic figures: Pre-war iron ore production, which peaked at 21,918 metric tons in 1913, fell to just 620 metric tons in 1915 and rose to a wartime high of only 2,035 metric tons in 1917. Crude steel production was nearly as anemic, falling from a peak of 4,687 metric tons in 1913 to 1,111 metric tons in 1915, and never again rising above 2,000 metric tons for the duration of the war. Worse for France, the Gilchrist-Thomas process, introduced in 1886, had made the high-sulphur iron ore deposits in Lorraine (then the largest in the world outside the Mesabi range in Minnesota) suitable for the large-scale production of quality steel, and these, after August 1914, were crucial to German shell production.
armies to the Hindenburg Line in March 1917, the evacuated regions of the departments of the Somme, Oise and Aisne had been systematically devasted "... with a completeness which owed a great deal to modern science and a great deal to national thoroughness."^5

Those left behind in rural areas after the mobilization found life difficult in several ways. The war began in the midst of the winter wheat harvest and, though the war

The losses to French agriculture were equally severe. The occupation zone included 6.3 million acres of cultivated land (over 6% of the arable in France) and the lost livestock ran to over 3 million head. See Michel Augé-Laribé and Pierre Pinot, *Agriculture and Food Supply in France During the War*. (New Haven: Yale University Press, 1927), pp. 55-56.

^D. W. Brogan, *France Under the Republic: The Development of Modern France* (1870-1939). (New York: Harper & Brothers Publishers, 1940), p. 495. See also B. H. Liddel Hart, *The Real War, 1914-1918*. (Boston: Little, Brown and Company, 1964), pp. 299-300, and C. R. M. F. Cruttwell, *A History of the Great War, 1914-1918*. Second edition. (Oxford: The Clarendon Press, 1940), pp. 400-02. The departments entirely or partially occupied were the Nord, Pas-de-Calais, Ardennes (entirely), Marne, Meuse, Meurthe-et-Moselle, Vosges, as well as the Somme, Oise and Aisne. The towns of Noyon and Ham were spared during the retirement to the Hindenburg line (designated by the Germans the Siegfried line), but everywhere else houses were pulled down, wells poisoned or otherwise contaminated, crossroads destroyed, trees that lined country roads were dropped across them (as Prussian troops had done in 1870--indeed, as the retreating French had done themselves in the neighborhood of Paris in September of that year), orchards cut down and explosive booby traps spread about. Jacques Chastenet, in his *Histoire de la troisième république. Volume 4: Jours inquiets et jours sanglants*. (Paris: Librarie Hachette, 1955), pp. 343-44, records that 342,197 houses were partially and 222,132 totally destroyed in the invaded departments.

The restoration of the invaded regions ("the greatest economic achievement of post-war Europe") required eight years and $3.5 billion, though "The owners of the heaps of rubble and water-logged foundations often insisted on building again on exactly the same spot and in the same style," so that "Some of the dreariest villages of northern France . . . appeared again in all their nineteenth-century hideousness." See Brogan, *France Under the Republic*, pp. 599, 600, and Hugh Clout, *After the Ruins: Restoring the Countryside of Northern France after the Great War*. (Exeter: Exeter University Press, 1996). Brogan makes an important point when he reminds his reader that "In less than two years' time, it was Germany's turn to be occupied by French troops whose tempers, in some cases, may have been rather frayed by what they had seen in 1917." (Ibid., p. 495)
guaranteed higher prices for agricultural products, production fell throughout the war as the dearth of agricultural labor never ceased to be a problem. Of the pre-war total of 5,200,000 male workers on the land, only 1,500,000 remained so employed in 1918—and many of these were old men and boys. The French first attempted to plug the labor gap with German prisoners-of-war, but, despite the fact that 75% of these were employed by July 1915, there were never enough hands and backs to go around.

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6See Brogan, *France Under the Republic*, p. 520. Brogan points out that one-fifth of the wheat crop was grown in the invaded departments, and much of the beet sugar and livestock were produced there as well. Yet even those crops comparatively unaffected by the movement of armies suffered production drops—Brogan notes that wine production dropped 20% during the war, though Champagne was the only significant wine-producing region located within the zone of the armies. Even this figure, however, may underestimate the damage. French government statistics record that France produced 60 million hectoliters of wine in 1914, only 20 million in 1915, and production only rose to 45 million hectoliters by 1918. See Statistique générale de la France, *Annuaire statistique*, Volume 36 (1919-1920). (Paris: Imprimerie nationale, 1921), p. 240. See also Michel Augé-Laribé and Pierre Pinot, *Agriculture and Food Supply in France During the War*, pp. 76-79, 211-14.


7See Richard B. Speed III, *Prisoners, Diplomats, and the Great War: A Study in the Diplomacy of Captivity*. (New York: Greenwood Press, 1990), pp. 81, 90. Speed notes that the problem was made worse by the army's lack of preparation for receiving prisoners, and further aggravated by the flow of refugees from Belgium and the invaded departments. And the shortfall could only partially be made good through the introduction of foreigners—principally from Spain and Portugal—of whom there were
The harmful effect of the labor shortage on agriculture, moreover, was exacerbated by transport problems and requisitions. The general mobilization orders of 2 August 1914 placed the entire French railway system under military authority and suspended commercial transport indefinitely. Rural France was thus "... thrown back into the old era of domestic economy, in which agriculture had to depend on its own land or neighborhood for everything it needed."* It was requisitioning, however, that caused the greatest resentment. Since 1877 the Army had the right to commandeer provisions in exchange for "... compensation representing the value of the goods supplied," but as a war of brief duration was expected, no coherent plan had been devised either to regulate prices or to equalize the burden of requisitions.⁹ People in towns and cities were 47,718 working on French farms by 1917. See Huber, *La population de la France pendant la guerre*, p. 200.

Still, France had the advantage of a rural economy organized as a "family industry": the rural population included over 3.2 million women who "... showed themselves capable during the war of managing farms, of directing workmen, and on occasion of making good the scarcity of [field] labor." See Augé-Laribé and Pinot, *Agriculture and Food Supply in France During the War*, p. 40. See also Gambier and Suire, *Histoire de la première guerre mondiale*, ii, pp. 284-89.

*Ibid.,* p. 64. When limited commercial railway service was reinaugurated in late autumn 1914, it was "... in practice almost non-existent." Military traffic always received priority. The amount of rolling stock was reduced by losses incurred in the occupied departments. The call-up of skilled mechanics required to keep the trains in working order kept many trains idle. And the dearth of coal (and the poor quality of much that remained) caused delays and breakdowns. See *Ibid.*, pp. 64-65.

⁹Quoted in Augé-Laribé and Pinot, *Agriculture and Food Supply in France During the War*, p. 72. Extensive litigation was also necessary to determine the precise meaning of "value": the Army wished to compensate for cost, while French producers insisted on market value.

The war and requisitions, however, proved at least a temporary boon to some producers: the vintners of the Midi "... had large stocks in hand [in August 1914] and had just got in an abundant vintage, which they could not hope to get rid of, seeing that
confronted with different problems. Because the nature and length of the war were ill-understood and unforeseen, the mobilization initially resulted in wage cuts and layoffs in luxury trades and industries deemed non-essential. In retrospect, some of these decisions appear absurd. The Renault motor works in Paris, employing 5,000 workers before the war, reduced its operation to constructing stretchers and little else in the weeks following mobilization.\textsuperscript{10} Gnome et Rhône, a manufacturer of airplane engines, saw its orders drop from a monthly average of 125 to just 15 in September 1914. Like Renault, however, Gnome et Rhône experienced a rapid turnabout in its fortunes in the winter of 1914-1915 and prospered throughout the war from military contracts.\textsuperscript{11}

consumers had disappeared and means of transport had failed." and they benefited even more from the decision of the Ministry of War to make wine a regular part of the French army ration. (\textit{Ibid.}, p. 76)


The war effort and the rapid retooling of industry to meet the war's demands sparked many changes in French demography; some were profound, some merely transient. The population of Rouen rose from 125,000 (according to the 1911 census) to 167,000 in 1918, an increase largely the result of the presence of a British Expeditionary Force (BEF) base and large numbers of Belgian refugees (the Belgian government-in-exile established itself at Le Havre); Bordeaux, with by late 1917 a large complex servicing the American Expeditionary Force (AEF), increased its metropolitan population from 350,000 to 446,000; Saint-Étienne (adjacent to the largest remaining French coal reserve) and Lyon became centers of armaments production and experienced almost 50% increases in their populations between 1911 and 1918; and the population of Bourges almost trebled for the same reason.¹²


Much of the growth of arms-producing towns during the war was entirely unplanned, even spasmodic, because the Government was determined to engage private industry to meet armaments requirements. Thus, in 1914, 76% of armaments employees worked in state-operated arsenals. By 1918, however, this figure would drop to only 18%. See Godfrey, Capitalism at War, p. 257, and Gerd Hardach, "Industrial Mobilization in 1914-1918: Production, Planning, and Ideology," in Fridenson, ed., The French Home Front, 1914-1918, p. 77.

The French Year Book: Statistical and Historical Annual of France for the Year 1919. (London: J. Bale, Sons & Danielsson, Ltd., 1919), p. 177, claims for Marseille a population of 947,000 in May 1918. Much of this wartime growth, however, proved to be evanescent. Tours, for example, housed transit camps for the French, Belgian and American armies, and increased its population by more than a third during the war. Yet, in the census of 1921, just 75,000 people lived there, only a few thousand more than in 1911.
The war had demographic effects aside from those of migration. The number of marriages plunged in 1914, from 17,100 in July to 9,600 in August to a wartime low of 3,800 in both October and November. The decline in live births was correspondingly precipitous, the figure for the 77 uninvaded departments falling from 604,800 in 1913 to 387,000 in 1915 and a wartime low of 313,000 in 1916.13

And with the mobilization of so many men, women began to enter the industrial workforce in substantial numbers. By 1918, female employment had increased sixfold in iron and steel production, fourfold in transportation, threefold in the building trades and more than doubled in the chemical industry, and women eventually represented 30% of the work force in war industries. By January 1918, moreover, more than 130,000 women worked in clerical positions in the army, "... whereas before the war not a single woman was employed in this form of work."14 By contrast, the decline in domestic employment already apparent in France was accelerated by the war—the census listed 930,000 so

13See Huber, La population de la France pendant la guerre, pp. 223, 249. War-time circumstances also tended to depress the divorce rate and increase the rate of illegitimate births. See Ibid., pp. 238, 252. The reason for the rapid decline of marriages and, later, of births, was of course the mobilization of August 1914, but this disruption was compounded by the lack of thorough planning. The French assumed, as did the other powers, that the war would be brief--six months at most. Hence, the French army possessed no formal leave policy until June 1915 (and when such policy was established, the French army was the most niggard in its allowance for leave). The gap thus opened in the French age-pyramid during the years 1915-1918 need not have been so large despite the enormous battlefield losses of 1914-1916.

employed in 1911, but only 784,000 in 1926.  

Even with work, however, people in urban areas found life onerous in ways large and small. The relocation of refugees and the migration of those seeking jobs in war-related industries swelled the demand for housing. The chronic shortage of coal meant higher prices and occasional cessation of deliveries altogether. Street lights in large cities were darkened. In Paris, streetcars and the Métro ran on reduced schedules. Government decrees mandated early closing times for restaurants and, by an arrêté of 25 January 1917, no meal at a public establishment could consist of more than two dishes.  

When the latter proved incapable of enforcement, a further decree (24 April 1917) required two meatless days per week, and the law of 10 February 1918 banned or restricted (by serving times or by amounts) the sale of milk (fresh, condensed, sour or curdled), butter, cheeses and sugar.  

15 See Patrick Fridenson, "Introduction: A New View of France at War," in Fridenson, ed., The French Home Front, 1914-1918. (Providence: Berg, 1992), p. 7. This fundamental change in the nature of employment received an immediate jolt from the war. The Commissaire spécial of Bordeaux, in his monthly report to the Prefect for December 1918, confidently noted that "In the munitions factories, the layoffs of women are nearly completed, without having given rise, in our region at least, to any serious or even noteworthy incidents." Still, the Commissaire worried because many of these women refused to return to domestic work—they would not take orders from masters any longer—and predicted "la crise de la domesticité." (See Archives départementales de la Gironde. 1M415: Rapport mensuel, no. 25938, 27 December 1918.)  

16 See Brogan, France Under the Republic, pp. 521-23, and Augé-Laribé and Pinot, Agriculture and Food Supply in France During the War, pp. 239-40.  

17 Ibid., p. 241. Desserts, unless they consisted merely of compotes, jams or marmalades, were expressly forbidden in order to conserve flour, cream, butter and eggs. The meat restrictions applied to frozen meat as well as fresh. Brogan notes that Parisians consumed only 15 tons of frozen meat per month before the war, but by 1918 consumed five to six thousand tons per month—when they could get it. See France Under the
Despite the attempts to curb consumption and augment imports, however, the pressure on prices was inexorable. The French government was thus compelled to take a series of \textit{ad hoc} measures in order to stabilize prices and guarantee civilian supply. The laws of 16 October 1915 and 20 April 1916 permitted the requisition of essential commodities (principally cereals useful in making bread, meat, sugar, milk, eggs, and oils and fats) to feed the civilian population and fixed the prices for these. The law of 10 February 1918 went much further, authorizing the government to "... regulate by decree the production, manufacture, circulation, sale, possession, and consumption of foodstuffs for man and beast, and of combustibles; and authorized them to requisition by decree the whole of the mercantile marine."\textsuperscript{18} Thus, by the spring of 1918 France had erected an apparatus of supply and distribution complete with bread cards, ration books and the bureaucracy to administer them. Ultimately, however, the consumer price index more than doubled during the war, creating a "... permanent seller's market and no amount of decrees could alter this fact."\textsuperscript{19} For industrial workers, and especially for munitions workers, these increases were offset by wage increases, particularly after 1916. The wage index for munitions workers (1913-1914=100) reached 125 in 1916, 150 in 1917 and 240 in 1918; wages for these workers outstripped the rising cost of living not only in the

\textsuperscript{18}See Augé-Laribé and Pinot, \textit{Agriculture and Food Supply in France During the War}, pp. 159-60. These laws remained in force until 15 August 1920.

\textsuperscript{19}Brogan, \textit{France Under the Republic}, p. 522.
provinces, but even in Paris. Those who suffered most, however, lived on fixed incomes; hence, "... the weakening of the position of the professional classes which began during the war was one of the most striking results of the war in French society. The official, envied by his fellows in 1913, was pitied by them, if noticed at all, by 1917."

Inflationary pressure was worsened by French Government policies. France, more so than any other belligerent, financed the war effort through borrowing; throughout the war, "... the Government of France did not raise in taxes enough to pay for its normal peace-time

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20 See Hardach, "Industrial Mobilization in 1914-1918: Production, Planning, and Ideology," in Fridenson, ed., The French Home Front, 1914-1918, p. 76. Hardach records that other workers did almost as well—the General Wage Index (1913-1914=100) reached 175 by 1918. What is even more interesting is the fact that the rise in the cost of living in the provinces outpaced that in Paris. This was likely the result of the extraordinary measures to keep Paris provisioned at subsidized prices—what had been a matter of law (and necessity) under the ancien régime appears to have become a national habit. Brogan notes that "The trading activities of the local authorities [in the provinces], taking place in a perpetually rising market, were generally profitable, although Paris suffered vast losses, written off as 'insurance against public disorder.'" (France Under the Republic, p. 522.)

21 Brogan, France Under the Republic, p. 523. See also Perreux, La vie quotidienne des civils en France pendant la grande guerre, especially part iv, chapter 1: "Les nouveaux pauvres," pp. 133-41.

A particularly good example of this phenomenon appears in the archival record. Near the end of the war, the Commandant of the 13th Military Region (Clermont-Ferrand), laments la vie chère and specifies the people who suffer most as "... celles qui sont composées par tous les 'nouveaux pauvres'--petits fonctionnaires, petits rentiers, petits propriétaires, petits employés, professeurs, magistrats, avocats, officiers ministeriels, etc.,--et qui n'ont pas profité de la guerre et en ont cruellement souffert. Toute cette classe moyenne, généralement très respectueuse des pouvoirs établis, commence à murmurer et à ne plus se résigner avec autant de bonne volonté." See Chateau de Vincennes. Service historique de l'armée de terre. 5N268: Bulletin confidentiel (15 novembre 1918), p. 32. And not just the officials suffered—the French infantryman was paid five sous per day, far less than his British or (eventually) American counterpart.
expenditure." Only in May 1916 did the Briand Government introduce legislation establishing an income tax, and resistance in Parliament delayed its promulgation until July 1917.\(^2\)

Worse than this, France borrowed money the easy way—through the agency of the printing press. The volume of notes in circulation on the eve of war stood at 5.9 billion francs; by December 1919, this had increased to 37 billion francs, and worst of all, "...it was in 1919 that the biggest increase in the note issue took place."\(^3\)

Still, in the spring of 1918, much of this dismal news lay in the future or was obscured by the obsessive secrecy practiced by all belligerent governments during the war. For almost four years the public imagination had been consumed with the progress of the war and with the doleful accumulation of casualty notifications. The "war of movement" on the western front in late summer and autumn 1914, when French and British armies were thrown back south of the Marne, was fraught with memories of the catastrophe of

\(^2\)Brogan, *France Under the Republic*, p. 517. The emphasis is Brogan's.


\(^4\)Brogan, *France Under the Republic*, pp. 518-19. Brogan specifies, and he is surely right, the reason for this profligacy with the money supply: "[T]he importance of getting in heavy taxes and lightening the paper burdens made the responsibility for the financial policy of the first year of peace more than any one reputation could stand. But the French parliamentary system [of the Third Republic] is designed for emergencies like these, since no financial responsibility is ever laid on one pair of shoulders." (*Ibid.*)
With the completion of a crude trench system extending from near the Swiss border to the Channel in late autumn 1914, a series of fruitless and bloody assaults and counter-assaults followed in 1915—at Neuve-Chapelle in March, at Festubert and Souchez in May, at Loos in Flanders in September—fruitless because both sides mounted these attacks against fortified trench positions bolstered by machine gun units and precisely registered artillery.

25 See Liddel Hart, The Real War, 1914-1918, pp. 54-70, 82-102; Cruttwell, A History of the Great War, 1914-1918, pp. 13-38; and Brogan, France Under the Republic, pp. 463-77. Beginning on 31 July, the standing French Army was moved to the frontier aboard 573 trains, a concentration completed by 3 August. Between 2 and 18 August, France mobilized 1,200,000 more men (from the recruitment classes 1887-1912) comprising 42 army corps, and moved them to the northeast frontier aboard more than ten thousand trains, together with 400,000 horses and mules, 80,000 wagons and the (barely) requisite weapons, ammunition, equipment, provisions and fodder. See Huber, La population de la France pendant la guerre, pp. 88-89, and Marcel Peschaud, Politique et fonctionnement des transports par chemin de fer pendant la guerre. (Paris: Les Presses Universitaires de France, n.d.), pp. 70-71. The French were also responsible for the transportation of the BEF once it arrived in France (principally through the port at Le Havre) in mid-August. These 115,000 men and 46,000 horses required a further 361 trains to be placed in line. See Ibid., p. 83.

In the "Battle of the Frontiers" (14-26 August) alone, France lost to casualties 300,000 men and 4,778 officers; the latter figure represents ten percent of the entire French officer corps. By the end of 1915 fully half of the regular officer corps mustered in 1914 were dead. See Alistair Horne, The French Army and Politics, 1870-1970. (London: Macmillan Press, 1984), pp. 34, 37.

Fortunately for France, the memories were not all French: "The idea of a Sedan was an obsession with the Germans, and led them to pluck the fruit before it was ripe. This premature wheel before Paris . . . sacrificed the conception of Schlieffen to the dream of Sedan . . ." (Liddel Hart, The Real War, 1914-1918, p. 61) Yet even here there must be qualification. The planned envelopement of Paris by von Kluck's First Army would have breeched the line of the German wheel, and should certainly have proved as ungainly a manoeuvre (and a greater strain on the supply services) as the strike to the southeast. In either case, the First Army should have been open to flank attack by the Paris garrison; the realization of the dream was only deferred until spring 1940.

26 Each belligerent government and general staff, however, had first to deal with (and suffer the political recriminations for) a shortage of artillery shells—each had begun
Even without offensive action, however, the trenches were dangerous places. The British armies lost 7,000 officers and men killed, wounded and sick every day along the front, and, considering Joffre's policy of "nibbling" (le grignotage) at the enemy in frequent, small-scale actions and the greater length of the front manned by French soldiers, daily French losses were greater still.\textsuperscript{27}

\footnotesize{the war with what it assumed would be a six-months supply, and this was exhausted by mid-autumn 1914. All belligerents, therefore, established Cabinet-level departments in spring 1915 in order to guarantee the munitions problem constant attention. In France, Albert Thomas was named Under-Secretary of State for Artillery and Munitions in May 1915. When Thomas took charge of the Under-Secretariat, French munitions plants produced 40,000 75mm shells per day, but French armies fired these shells at the rate of 100,000 per day; by the end of the war, France would produce 212,000 75mm shells per day. See Bonnefous, Histoire politique de la Troisième République, ii, p. 80, and Godfrey, Capitalism at War, pp. 184, 187.

For the inability of tactics to keep pace with technology, especially during the war's first 24 months, see Paddy Griffith, Battle Tactics of the Western Front: The British Army's Art of Attack, 1916-1918. (New Haven: Yale University Press, 1994), especially chapters Seven ("Automatic Weapons") and Eight ("Artillery").

That the French were so dilatory in upgrading their weaponry should not surprise. The French Army had pioneered the recoiling field gun with the introduction, in 1897, of the 75mm, the soixante-quinze, and the 75mm remained the standard of excellence for mobile artillery throughout the war. A four-gun battery could fire 4,000 rounds of time-fused shrapnel shell per hour. See Gerard Demaison, "From Verdun to the Maginot Line," in Steven Weingartner, ed., A Weekend with the Great War: Proceedings of the Fourth Annual Great War Interconference Seminar. (Wheaton IL: Cantigny First Division Foundation and White Mane Publishing Company, Inc., 1996), p. 23. But the flat trajectory of the 75mm was unsuited to trench warfare. Ultimately, it would be British, German and (belatedly) French siege mortars and guns, operated with benefit of wireless communications and aerial reconnaissance, that would make artillery barrages so precise and, consequently, trench warfare so murderous.

\footnotesize{For an evocative account of the British experience on the western front, and one that has largely withstood the scholarly scrutiny of military historians, see Paul Fussell, The Great War and Modern Memory. (New York: Oxford University Press, 1975.) French losses, averaged across the war, amounted to 931 soldiers killed per day.}
These losses had domestic repercussions. The *union sacrée*, so vividly personified in the exchange between Albert de Mun and Édouard Vaillant on the Chamber floor on 5 August 1914, was wobbled not only by the wastage of men and the prolonged occupation of French territory, but also by the extraordinary measures taken at home to prosecute the war effort. Alexandre Millerand, the lapsed socialist who became Minister of War in the first Government of the *union sacrée*, declared "There are no more workers' rights, no more social laws, there is only the war." To this end, Millerand suspended regulation of working hours (the eight-hour day would be implemented only in 1919) and relaxed standards for factory safety. Moreover, to rebuild the pool of skilled labor depleted by mobilization but required for munitions production, the Government in 1915 gave military contractors the opportunity to comb through army ranks and select workers for deenlistment. This system caused resentment for several reasons. Manufacturers commonly selected younger, stronger and cheaper workers (and, often, their relatives), leaving behind older men in the army. Once back in the factory, these demobilized workers remained under compulsion—they could neither strike nor protest the reduction of their wages or the extension of their working hours (nor, if they wished, contest their deenlistments).

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28 Quoted in Godfrey, *Capitalism at War*, p. 183. This was René Viviani’s ministry of 26 August 1914-29 October 1915.


30 See *Ibid.*, pp. 48-49, and Hardach, "Industrial Mobilization in 1914-1918: Production, Planning, and Ideology," in Fridenson, ed., *The French Home Front, 1914-1918*, pp. 73-74. By September 1915, the Army had released 500,000 men for consignment to munitions factories and refused to release more. It was this decision that
industries, and thereby minimize the appearance of favoritism or coercion, the Chamber passed the *loi Dalbiez* on 17 August 1915. This legislation authorized departmental commissioners to determine the qualifications of all those who received the *sursis d'appel*, it therefore served to rid the factories of shirkers (*les embusqués*) and, more important, interposed the state between industry and army on a case-by-case basis.\(^1\) The staggering losses of men and matériel, and the manifold dislocations experienced in civilian life during the first eighteen months of the war reflect the fact that, the *Entente cordiale* notwithstanding, France had recourse to little more than its own resources during this period. The British Expeditionary Force grew slowly, reaching 500,000 men only in June 1915; not until March 1916 could Great Britain land and maintain one million soldiers in France—and a substantial minority of these were support personnel, not combat.

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\(^1\)For a detailed study of the functioning and effects of the *sursis* system in one department (the Isère), see P. J. Flood, *France, 1914-18: Public Opinion and the War Effort*. (London: The Macmillan Press, Ltd., 1990), pp. 57-69. In the end, if the *loi Dalbiez* mollified public opinion about the inequities of the *sursis* system, it did little to squeeze more men into French armies—only 13,081 men were incorporated between 1915 and 1918 as a direct result of the *loi Dalbiez*. See Huber, *La population de la France pendant la guerre*, pp. 94-95.

Then again, one must take into account the relatively small number of shirkers. The General Staff had feared that on the outbreak of war as many as 13% of the *mobilisés* would fail to report; in the event, only 1.5% of those called were listed as *insoumis*. See Gambier and Suire, *Histoire de la première guerre mondiale*, i, p. 116. See Cobb, "France and the Coming of the War," in Evans and von Strandmann, *The Coming of the First World War*, pp. 142-43, for interesting examples as to what became of some of those *insoumis*.
effectives.32

32 See Great Britain. The War Office, Statistics of the Military Effort of the British Empire during the Great War, 1914-1920. (London: His Majesty's Stationery Office, 1922), p. 64. France lost 995,000 soldiers to casualties in 1914, and 1,430,000 in 1915. See P. M. H. Bell, France and Britain, 1900-1940: Entente and Estrangement. (London: Longman, 1996), p. 64. Bell points out that the actual agreement that solidified the Entente, signed 8 April 1904, "... when closely examined, was a mixed bag of bargains over territory in Africa and Asia and regulations about fishing for bait off Newfoundland," and did not mention Germany at all. See Ibid., p. 30.

Any account of the Third Republic's conduct during the early months of the war, therefore, should recognize the flimsy nature of the "cordial understanding," and how freely this agreement could be interpreted in the event of a European war. In summer 1914 the British Army included only seven divisions of Regulars—about 90,000 combat troops and 53,000 animals—along with the Territorials, in whose discipline and effectiveness no one had any confidence. Four divisions embarked for France on the completion of mobilization, two more followed on 19 August and 1 September, and the seventh arrived in October. None of these divisions possessed any heavy artillery whatsoever.

If the French found British numbers (or lack of them) distressing—the crucial French partner within the Triple Entente, calculated purely by the numbers, was, of course, Imperial Russia—these were no more surprising than British attitudes. During the July crisis, many Britons, within and without the Government, assumed that Britain's role in a Franco-German war would emphasize the action of the Fleet, whether through engagement or blockade. This view that one could be of the fight but not in it was by no means restricted to the Manchester Guardian: "[Lloyd George] also evidently contemplated our going a certain distance with France and Russia in putting diplomatic pressure on Austria. Then if war broke out we might make it easier for Italy to keep out by, as it were, pairing with her." (See Trevor Wilson, ed., The Political Diaries of C. P. Scott, 1911-1928. [Ithaca, NY: Cornell University Press, 1970], pp. 91-92.)

The French Government and High Command must have understood that these aspirations were futile. As Brogan points out, regardless of the "scrap of paper," the imperatives of coastal geography alone would have required British participation with the Entente: without access to the Channel ports, with the threat of submarines and long-range guns based in Channel, Atlantic, and Mediterranean ports "... the semi-island might have to make very poor terms. ..." with a victorious Germany. (France Under the Republic, p. 486.) Delcassé had understood the connection between Fashoda and the Entente: "To renounce Egypt was a crime against the memory of Bonaparte; to renounce Alsace and Lorraine would be a crime against the national principle, an infringement of the Rights of Man." (A. J. P. Taylor, "The Entente Cordiale," in From Napoleon to Stalin: Comments on European History. [London: Hamish Hamilton, 1950], p. 99) As so often, Brogan saw as clearly, and earlier: "... Delcassé was too good a Gambettist to forget for a moment the wound of Strasbourg under the influence of the irritation of the scratch of
Yet the great test of endurance—physical, psychological, moral—that the war became crystallized only in 1916 with the struggle at Verdun. General von Falkenhayn, Fashoda. (France Under the Republic, p. 326).

It should be borne in mind, however, that Delcassé had been the Minister of Foreign Affairs—the French people did not go to war in 1914 so much to recover Alsace and Lorraine (a wish, perhaps, of their grandfathers' generation, now moribund save in the eastern departments) but, as Jean-Jacques Becker demonstrates, out of a sense of duty and with an air of resignation. See his "That's the Death Knell of Our Boys..." in Fridenson, ed., The French Home Front, 1914–1918, pp. 32–33. But note that Becker collected his data (primary school teachers' reports on local morale during the mobilization) from predominantly rural departments far from the zone of the armies. Note also Becker's self-congratulation for his discovery: "These results are astounding. Much of what is often alleged is invalidated by this evidence that the subjects of revenge and Alsace-Lorraine actually played a very small part in shaping public opinion." (p. 32) Not so astounding, perhaps, for Gordon Wright: "If most Frenchmen never really forgave the Germans after 1871, the idea of revanche had clearly lost most of its appeal by the nineties, and even prior to that time references to the lost provinces had taken on a character that was often more ritualistic than passionate." (France in Modern Times: 1760 to the Present. [Chicago: Rand McNally & Company, 1960], p. 379.)

But if the spirit of revanche no longer excited the passions of an earlier generation, the recovery of the three departments lost in 1871 remained a matter of state policy; indeed, Plan XVII called for an offensive into Lorraine and Alsace at the outset of any war with Germany; and there were Frenchmen vital to the exercise of that policy who could not forget. The President of the Republic, Raymond Poincaré, was a Lorrainer, as was, even more passionately, General Lyautey, to name just two.

If any doubt remains as to which the dog and which the tail in the Entente relationship, the reader need only recall that in the two most urgent crises of the war for the Allies (September 1914 and March-June 1918), when French commanders hinted that it might be necessary to disengage French armies from the right wing of the BEF in order to retreat and cover Paris, it was officials of His Majesty's Government who panicked and crossed the Channel to confer with their ally, not the other way round. See Churchill's confidential memorandum to the War Cabinet dated 18 April 1918, reproduced in his The World Crisis, 1916-1918. Volume ii. (New York: Charles Scribner's Sons, 1927), pp. 163-66. Churchill concluded that it would be fruitless "...to let go the right hand, lose contact with the French, watch them being defeated, then be driven into the sea ourselves, and lose the Channel ports after all." (p. 165)

In the event, this is precisely what happened in May-June 1940--save the BEF did not linger at Dunkirk to witness the surrender of the nearly 40,000 French troops who had covered the evacuation.
chief of the German General Staff, chose Verdun as his target because a concentration of French forces there could threaten German rail heads at Metz and the Briey-Thionville iron basin (crucial to German munitions production), but most of all because the French dared not surrender it. Verdun's ring of steel-reinforced concrete fortresses made it the most heavily fortified city in Europe and its loss would have reverberated through the Army and the nation, the more so as Verdun possessed enduring national significance. Hence, every available French soldier could be drawn into the battle and French armies depleted of their best combat effectives and reserves. This strategy of attrition would

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33Verdun (along with Toul, Metz and Nancy) had been a chronic source of conflict between French kings and Habsburg emperors throughout the seventeenth century; the ultimate aim of the Bourbons was the absorption of Lorraine and the completion of the "quadrilateral" of fortresses to protect France's eastern frontier.

The siege and anticipated surrender of Verdun to the Prussians on 2 September 1792 provided the pretext for the September Massacres in Paris, and French resistance at nearby Valmy (the "Miracle at Valmy") three weeks later precluded a Prussian march on Paris and so preserved the Republic declared on 21 September by the National Convention. With the loss of Alsace and portions of Lorraine in the Treaty of Frankfort (10 May 1871), Verdun once again became the linchpin of France's eastern defenses, and so de Rivières continued the work of Vauban. For a summary of le système Séré de Rivières, see Guy Pedroncini, et al., Histoire militaire de la France. Volume 3: De 1871 à 1940. (Paris: Presses Universitaires de France, 1992), pp. 29-33.

But Verdun had other, older claims upon the Gallic imagination. The city stood at the entrance through which barbarians pushed west into Gaul during the late Roman empire. Attila did so in 451, and, as Gibbon notes, plundered and burned Metz. Alistair Horne claims that the Huns burned Verdun—Virodunum—as well; see his The Price of Glory: Verdun, 1916. [New York: St. Martin's Press, 1963], p. 46). And it was in the Treaty of Verdun that Charlemagne's grandsons divided his empire in 843.

All this history was invested in a dreary, provincial, garrison town "... with one of the vilest climates in France." (Ibid., p. 349) Yet the French are like other peoples. Such a place can be the butt of national jokes only to the point where it might be lost (and become the butt of some other people's jokes)--then it becomes sacred ground. For an example of this phenomenon at work during the mobilization, see Cobb, "France and the Coming of the War," in Evans and von Strandmann, eds., The Coming of the First World War, pp. 133-34.
maximize Germany's demographic advantage: a nation of 65 million that trades casualties one for one with a nation of fewer than 40 million must prevail in the end.\textsuperscript{34}

The assault on Verdun began with a nine-hour bombardment of two million shells on 21 February, and by the 25th Pétain had been assigned the command of the entire fortified region.\textsuperscript{35} The scope of the emergency was such that the road from Bar-le-duc to

\textsuperscript{34}There is still some question \textit{when} the assault against Verdun became primarily one of attrition. Liddel Hart argues plausibly that the first phase (21 February-9 March) was directed towards breakthrough (and should have succeeded had German armies struck west, as well as east of the city in the initial assault), and only after the successful French counter-assaults of early March did von Falkenhayn settle for a strategic—and ultimately vain—blood-letting. See \textit{The Real War, 1914-1918}, pp. 222-23. Chastenet suggests that it was at this point that the nature of the war on the western front fundamentally changed, that "... war ceased to be an art and became a scientific game of Aunt Sally [\textit{jeu de massacre}]." See his \textit{Histoire de la Troisième République}, iv, p. 258. As elsewhere, unless otherwise noted, all translations are the writer's.

\textsuperscript{35}The crisis that brought Pétain to the fore was the abandonment, without a fight, of Fort de Douaumont (the fortress that commanded the heights northeast of the city) on the 25th. This fort, begun in 1885 and improved repeatedly thereafter, was the largest of those at Verdun, a quarter-mile in diameter, protected by a split concrete shell eight feet thick (it sustained 120,000 direct hits during 1916, including bombardment with 420mm siege mortars, and maintained its structural integrity) and equipped with 155mm and 75mm guns in retractable turrets. Alistair Horne notes that German possession of Douaumont cost as many as 100,000 French lives. See Horne, \textit{The Price of Glory}, pp. 106-08, 116. What is more, once Fort Douaumont became a bastion of the German line at Verdun, the French in their turn bombarded the fort with \textit{their} artillery to no avail, and the staying power of Douaumont against the heaviest French and German artillery led, with inexorable logic, to the French decision to construct the Maginot Line after the war. See Gerard Demaison, "From Verdun to the Maginot Line," in Weingartner, ed., \textit{A Weekend with the Great War}, pp. 20-21.

The volume of shells fired during the brief preparatory bombardment would become routine later in the war (the Germans would employ more than 6,000 guns in the short bombardment that preceded the offensive of 21 March 1918, for example, and would obliterate entire regiments with them), but the sheer weight and ferocity of the shelling at Verdun was then quite new and, accordingly, terrifying. In this light, Brogan's description of the first few days' fighting as "... innumerable Thermopylaes under a sky darkened by more formidable missiles than the Persian arrows," (\textit{France Under the}}
Verdun (supplemented only by a narrow-gauge railway, the Meusien) was the only passage to Verdun immune from direct German fire and so was placed under military authority as a route gardée. This eighty-kilometer stretch of road became la voie sacrée that kept Verdun reinforced and resupplied for the duration of the offensive.\textsuperscript{36}

The fighting at Verdun dragged on through the summer of 1916. The last concerted German attack stalled on 23 June when began the British preparatory bombardment for the Somme offensive. After this date fresh German divisions, supplies and ammunition were diverted to Picardy to resist the Anglo-French effort that commenced on 1 July.\textsuperscript{37} The ground lost in the winter and spring was largely recovered

\textsuperscript{36}See Cruttwell, \textit{A History of the Great War, 1914-1918}, p. 247; Liddel Hart, \textit{The Real War, 1914-1918}, pp. 221-22; Girard Lindsley McEntee, \textit{Military History of the World War.} (New York: Charles Scribner's Sons, 1937), pp. 273-74; and Bonnefous, \textit{Histoire politique de la Troisième République}, ii, p. 124. The road was maintained by 13 battalions of territorial troops, with each of six sections placed under an officer responsible for the maintenance of traffic: if a truck broke down and could not be towed immediately, it was pushed into the ditch. The road was, indeed, organized as a railway--each section was connected with the next by telephone so that "Columns of lorries could then be admitted on to the road and despatched along it to a timetable, and their progress signalled from point to point just as on a railway." (A. M. Henniker, \textit{Transportation on the Western Front, 1914-1918.} [London: H. M. S. O., 1937], p. 153.) In the first two weeks alone, almost 200,000 men and over 25,000 tons of munitions and supplies passed over the road. At the height of the siege, 6,000 trucks used the road per day, a volume of traffic equal to the passage of one truck every 14 seconds. Horne claims that French Territorials shovelled as much as three-quarters of a million tons of gravel onto this unpaved road during 1916. See \textit{The Price of Glory}, p. 148.

\textsuperscript{37}See Liddel Hart, \textit{The Real War, 1914-1918}, p. 223. The last German offensive action at Verdun was directed at Fort de Souville, on the Belleville Heights just northeast of the city on 11-12 July. It was here that the Germans first used phosgene gas, to no
in a series of French counter-attacks begun in October under Robert Nivelle, and by late
December Verdun was once again a comparatively quiet sector of the western front.

But this was the peace of the grave, and not just for France. Over 250,000 men
died at Verdun in 1916, over half of them French, and France suffered another quarter of a
million seriously wounded. Altogether, three-quarters of the entire French army saw
service at Verdun in 1916, and many of these units were rotated into Verdun five or six
times.\(^{38}\) When those of the Somme offensive are included in the roster of casualties for
1916, the toll of all dead, wounded and missing climbs close to two million for the
belligerent powers on the western front alone—and no ground of strategic value was

\(^{38}\)See Huber, *La population de la France pendant la guerre*, p. 419. See also
(17 February 1991): Section 4, pp. 7, 9, and Demaison, "From Verdun to the Maginot
Line," pp. 19-20. The figures for the dead also include the *disparus*, and there were so
many of these on both sides of the line at Verdun (and so many died the result of high
explosive shell blasts) that frost heave still forces their bones to the surface each spring.
When discovered, these remains are added to the ossuary established at Verdun, where the
bones of approximately 150,000 unidentified dead are entombed. And note especially the
ratio of dead to wounded: approximately 2:3 in the French armies. These figures indicate
the preponderant place assumed in combat by the artillery on both sides of the conflict on
the western front, and also serve to confirm Brogan's judgment, that "If, in 1915, he [the
poilu] had shown that the old *élan* in attack was not lost in the most hopeless
circumstances, in the spring of 1916 he showed that he could die where he was put as well
as any soldiers the world has seen." (*France Under the Republic*, p. 488.) This ratio also
highlights the scandalous state of hygiene in the French Army, even in rear areas. See
Chapter 3, below.
gained by either side.39

In France these losses sent tremors through the Army and the Republic. The first secret session of the Chamber of Deputies was held on 16 June 1916 in response to an interpellation concerning the inadequacies of the defensive works around Verdun the previous February; the investigations of the Army Commission in the Chamber would result in Joffre's replacement as commander-in-chief by Robert Nivelle in December 1916.40 But civil authority, having for the moment regained the whip hand, went further.

Great Britain absorbed 410,000 total casualties for its part in the action along the Somme between July and November 1916, France another 190,000 in its sector of the front south of the river, and Germany a total of 500,000 in defending its lines. This last figure is so high as many of the fruitless British assaults in the wake of the bloody failure of the first day of the offensive (1 July) were repulsed and followed by equally bloody and vain German counter-assaults. See Cruttwell, *A History of the Great War, 1914-1918*, p. 276.

The Somme offensive, however, was not a complete failure for the Allies. Late 1916 marks the point when German armies could no longer readily replace their casualties—by late spring 1918, the Allies would finally achieve superiority in numbers, and the addition of American divisions that year (and the promise of many more in 1919) would create a preponderance of men that, ultimately, German units could not resist.

Indeed, this was the first secret session of the Chamber in the history of the Third Republic. There would be seven more during the war (Joffre's fate would be decided during the third, 28 November—7 December 1916), the last concluding on 10 October 1917. See Bonnefous, *Histoire politique de la Troisième République*, ii, pp. 126-27, 197-213. Joffre was kicked upstairs, made a Marshal of France (the first since Canrobert in 1870—Foch would be so honored, in August 1918, and become the 384th Marshal of France) and shortly thereafter retired. Nivelle was promoted over the heads of his seniors (he was only 58) both because of his successful counter-offensives at Verdun in autumn 1916 and for his ability and willingness to charm and cooperate with the deputies. The deputy who questioned the Army's preparation at Verdun and so brought about the first secret session was Albert Favre (Charente-Inférieure); the most penetrating questions, however, were posed by André Maginot (Meuse), who had been severely wounded at Verdun in 1915.

The forts around Verdun had been stripped of many of their guns during the first two years of the war because, in light of the quick reduction of the defenses of Liège and Namur in August 1914, these forts were mistakenly assumed to be of little practical value.
Joffre's senior staff were purged or superannuated, many of the junior staff reassigned to line regiments and the G.Q.G. (Grand Quartier Général, French General Headquarters) removed from Chantilly to Beauvais. The politicians thus proved in the winter of 1916-1917 that they could discipline the high command; too many troops of the line, however, emerged from the ordeal of Verdun deaf to the customary appeals to reason, duty and patriotism, particularly when those appeals were made from the comfort and safety of Paris. If the typical French trench of the First World War was "... nasty, cynical, efficient, and temporary," those at Verdun were not really trenches at all, but more or less continous (but ever-changing) lines of shell holes, so that the infantry were exposed to the weather as well as to shelling. Add to this the difficulty of transporting provisions, the impossibility of maintaining effective communications links, especially between forward units and the artillery, the utter inadequacy of the Service de santé militaire to treat the wounded even when these could be evacuated to the rear, the general putrefaction evident across the battlefield, and Verdun really was very Hell. Little wonder that more than one

(see above, note 35); because even these exemplary feats of French military engineering stirred memories of 1870--Bazaine surrounded inside Metz, MacMahon trapped at Sedan; and because of the urgent need of those guns elsewhere on the western front. See Horne, The Price of Glory, pp. 49, 108.

Chantilly was notorious for intrigue and back-stabbing; the Chamber was determined to break up this clique of "... operations officers, 'the young Turks,' who constantly displayed an insolent disdain for politicians." (Cruttwell, A History of the Great War, 1914-1918, p. 395.) Joffre vaguely had seen it coming. When he relieved Foch of his command in early December 1916, he told him "You are limoged [limogé], I will be limoged; we will all be limoged." (Quoted in ibid. Limoges was the headquarters of a corps of the Army of the Interior where officers, passed over for promotion or discredited, were customarily assigned pending retirement.)
French unit in the autumn of 1916 marched north from Verdun bleating like sheep.\textsuperscript{42}

The bromide to soothe this growing disaffection was to be Nivelle's offensive of spring 1917, a strike across the Aisne river in Champagne utilizing the creeping barrage that Nivelle had pioneered at Verdun the previous autumn. Other events, however, interposed themselves. Germany resumed unrestricted submarine warfare in late January 1917 and, as most of the neutral vessels sunk were of American registry, the United States

\textsuperscript{42} The quote is from Fussell, \emph{The Great War and Modern Memory}, p. 45. Often the provisions had to be carried forward by soldiers—the horses and donkeys were spooked by the noise of the bombardments and, more pitifully, had no effective defense against the frequent gas attacks—and, consequently, during the most intense fighting troops often went without food and wine, or even water, while in the line.

These hardships were compounded by haphazard communications—telephone cables could not be laid deep enough to withstand the shelling (none had been buried before February), and the smoke and fog shrouding the battlefield limited the usefulness of signal flags, lights and rockets. The breakdowns in communications led to numerous friendly fire casualties—as many as 20\% of French shell casualties at Verdun were inflicted by French batteries. It has been estimated that 75,000 French soldiers died during the war the result of French artillery fire. (See Horne, \emph{The Price of Glory}, p. 99)

These problems were made worse by the restricted area of operations at Verdun; most of the fighting took place in zones northeast and northwest of the city, areas no greater than 25 square miles each. The compaction of the battle zone greatly increased casualties—defense in depth was impossible in such limited space; hence, the infantry had to be crowded to the front line, and so became cannon fodder. In the intense engagements of early June, the French exhausted, through casualties, one division every 48 hours. When the wounded were evacuated, and many thousands could not be, they discovered deplorable conditions even at base hospitals—Horne records one instance where a 3,500-bed hospital possessed only four thermometers. And strewn everywhere about the Verdun battlefield there were body parts of men and animals, pockets of gas and the threat of tetanus. So bad were conditions at Verdun that soldiers' letters made few references to lice, the scourge of every other theater of trench operations. See Horne, \emph{The Price of Glory}, especially chapter 15, and pp. 73-74, 322. For an extended discussion of tetanus in the Great War, see Sir Arthur Hurst, \textit{et al.}, \emph{Medical Diseases of War}. (Baltimore: The Williams & Wilkins Company, 1944), pp. 413-36.

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declared war on Germany on 2 April and joined the Allies as an Associated Power.\textsuperscript{43} Then in March 1917, in the midst of bread riots staged by munitions workers in Petrograd (and the rioters were joined by troops recalled from the front to quell the disturbances), Nicholas II abdicated the throne, Alexander Kerensky cobbled together the Provisional Government, and the Russian war effort thereafter stumbled by fits and starts towards collapse.

If in spring 1917 an American army in France was just a promise, it was at least a promise that the French could count on for (late) 1918. The revolution in Russia,

\begin{footnotesize}
\begin{enumerate}
\item German U-boats sank 540,000 tons of shipping in February, 600,000 tons in March and 870,000 tons in April, all in an attempt to drive Great Britain from the war and so finish off France before the United States could bring its force to bear on the western front. That the German High Command would take such a gamble—and Germany had become a \textit{de facto} military dictatorship with the dismissal of Falkenhayn and the elevation of Hindenburg as chief of staff and Ludendorff as first quartermaster-general in late August 1916—is a measure of both their confidence and their desperation; one should bear in mind that the U.S. Army in 1917 was smaller than that of Belgium—and not so well equipped. Hindenburg particularly expressed no fear of American entry into the war. See David Thomsom, \textit{Europe Since Napoleon}. Second edition, revised. (New York: Alfred A. Knopf, 1967), pp. 529-31, and Gordon A. Craig, \textit{The Politics of the Prussian Army, 1640-1945}. (New York: Oxford University Press, 1964), pp. 306, 318-26.

The Americans did manage to land the 1st Division in France on 28 June, but this was entirely ceremonial—the division was still incomplete. The 1st Division finally entered the line in a quiet sector north of Lunéville on 21 October 1917; it did so short of horses and winter clothing, with mobile kitchens and trucks borrowed from French units, and its regiments were added to French divisions. As a measure of the thinness of the American combat presence in France before spring 1918, only consider the total of American combat casualties for 1917: 15 killed, 60 wounded. The entire American complement in France on 31 December 1917 amounted to just 9,804 officers and 165,080 enlisted men, and fully half of these had arrived since the end of October. See Pershing, \textit{My Experiences in the Great War}, i, pp. 87, 200-01, 213, 268, and The Office of the Surgeon-General. Albert G. Love, \textit{et al.}, \textit{The Medical Department of the United States Army in the World War} (hereafter: \textit{The Medical Department of the U.S. Army}). Volume XV: \textit{Statistics}. Part Two: \textit{Medical and Casualty Statistics}. (Washington: Government Printing Office, 1925), p. 1017, Table 105, note a. To simplify record-keeping, the Medical Department in its history of the war folded in the 1917 casualties with the figures for 1918.
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\end{footnotesize}

26
however, and the consequent uncertain future of the Russian war effort, lent urgency to
Nivelle's guarantees of breakthrough in 1917. This offensive opened on 16 April along the
Aisne river and immediately bogged down into a bloody stalemate. Nivelle neither
achieved the promised breakthrough nor ordered the prearranged cessation of operations
in case of failure—the attacks continued into the first week of May and "... what the
German attack had failed to do in 1916, seemed on the point of being done by the French
attack of 1917, the combatant spirit of the French Army seemed to be broken."

Mutiny broke out in the French Army on 3 May and, by the time order was
restored in the autumn, fifty-four divisions, half the army of the line, had either refused to
return to the trenches from rest camps or refused to participate in attacks once entrenched.

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44 Brogan, France Under the Republic, p. 497. French units did recapture the
Chemin des Dames, but in light of Nivelle's buoyant, self-confident optimism, tactical
success was not enough, and the Minister of War, Painlevé, summoned Pétain to replace
him. Nivelle's offensive produced 90,000 casualties by the end of the second day (17
April); Nivelle had predicted 10,000, and, as a result, French evacuation and hospital
services were once more overwhelmed. Horne cites an instance where "... some two
hundred wounded literally assaulted a hospital train." And once again French regiments
were heard to bleat like sheep during their march to the front. See Horne, The Price of
Glory, p. 322.

Alfred Mignon, in his Le service de santé pendant la guerre, 1914-1918. Four
volumes. (Paris: Masson et Cie., 1926-27), iii, p. 94, admitted "Alas! the great hopes [for
the Aisne offensive] were not realized. The Staff and the service de santé experienced
some miserable days ["ont connu des jours malheureux"]). These included a secret session
of the Chamber on 29 June 1917, where Justin Godart, the Under Secretary of State, and
the service were singled out and excoriated for their apparent failure ("Plusiers
réquisitoires sévères ont été prononcés contre notre service, sans que personne se soit levé
pour le défendre." Ibid.).

For Mignon, however, even Nivelle's offensive contained a silver lining:
"Nevertheless, the offensive on the Aisne was as good as a great victory to the service de
santé. It brought a measure of autonomy to the service that had theretofore been denied." And
this was the result of G. Q. G.'s acceptance of "... the crucial role of the service de
santé in the success of an offensive." (Ibid.)
Pétain, promoted to commander-in-chief, succeeded in restoring discipline by visiting almost 100 divisions in person, promising increased leave and prompter transportation for the permissionnaires, better rest facilities, better food, and by appearing to minimize the reprisals taken against the ringleaders of the mutiny. French troops would regain their effectiveness in attack in summer 1918, but the army that had defended Verdun only to be massacred on the Aisne could not be restored to its old reliability.45

The parlous state of the French Army left the British Army to carry the weight of Allied offensive operations for the duration of 1917, and the BEF responded with the strike at Messines in June and the Third Battle of Ypres, a fourteen-week assault against


The estimates vary as to the precise number of executions. Cruttwell numbers the executions at 23; Keegan records 49 executions carried out from among 23,385 guilty verdicts for mutiny; Brogan does not venture a number, writing only that "... punishment was comparatively little used, although power was taken to execute without appeal to the civil authorities." (France Under the Republic, p. 498); Horne mentions "a few dozen" shot but "... how many more were shot summarily can only be guessed. From time to time accounts have seeped out, unofficially, of whole units marched to quiet sectors and then deliberately haché [chopped up] by their own artillery." (The Price of Glory, p. 323)

Most important, G.Q.G. kept word of the mutinies (and the reprisals) from German intelligence; even the Allied commands possessed only incomplete knowledge, and this informed more by rumor than fact. See, for example, Pershing, My Experiences in the World War, i, pp. 136-42. Pershing refers repeatedly in his diary entries for 1917 to the "shattered morale" of the French Army, and was invited by Pétain to observe the successful French assault on the Mort Homme (northwest of Verdun) on 20 August 1917, one of the carefully planned engagements through which Pétain began to restore the Army's self-confidence, and the confidence of the nation and its allies in it.
the German lines in Flanders begun in late July. The Messines attack was a tactical
success, but Third Ypres proved to be a reprise of the Somme campaign—poorly planned
artillery and heavy rainfall churned the battlefield into a slough and elastic German
defenses exacted three times as many British as German casualties.46

The ineptitude within the BEF High Command was now compounded in the winter
of 1917-18 by the dwindling supply of men. The BEF had suffered 760,000 casualties in
France alone in 1917, and in March 1918 would have 180,000 fewer effectives in France
than the year before.47 This crisis in Allied manpower was, in turn, made the more urgent
by the Bolshevik Revolution and the opening of peace talks at Brest-Litovsk in November
and December 1917. The collapse of the eastern front guaranteed that a victorious
Germany would shift troops west in anticipation of a large-scale offensive in the spring of

46See Cruttwell, A History of the Great War, 1914-1918, pp. 436-43; Liddel Hart,
The Real War, 1914-1918, pp. 330-43; and Fussell, The Great War and Modern Memory,
pp. 14-16, 84-89. At Messines the British spent 18 months digging tunnels towards
German positions and exploded 500 tons of high explosive directly beneath their bunkers
on the morning of 7 June, permanently entombing as many as ten thousand soldiers and
permitting the capture another 7,000. The fiasco at Third Ypres was attributable both to a
prolonged artillery bombardment of ten days, destroying any element of surprise, and the
resulting destruction of the local drainage system despite the explicit warnings of the
Belgian Ponts et Chaussées. These blunders doomed an offensive notorious for its mud
and cold to become "... a synonym for military failure." (Liddel Hart, The Real War,
1914-1918, p. 337)

47See Cruttwell, A History of the Great War, 1914-1918, p. 501. This left
514,637 infantry and 38,412 men in the Machine Gun Corps. See The War Office,
Statistics of the Military Effort of the British Empire During the Great War, 1914-1920,
p. 65. See also Lloyd George's letter of 2 December 1917 to Col. House, quoted in
Pershing, My Experiences in the World War, i, p. 255: "We should be hard pressed to
hold our own and keep Italy standing during 1918. Our manpower is pretty well
exhausted. We can only call up men of 45-50, and boys of 17. France is done."
France responded to this physical and moral crisis on two fronts. The first amounted to a political revolution: "The disasters of the spring, the Russian Revolution, the mutinies, had brought France to the cross-roads. She could sacrifice everything to winning the war; she could decide to make peace on what terms she could get; she could not continue in the state of growing indecision and pessimism." France chose the first course. No longer would pacifism or defeatism be tolerated, even (or particularly) in high places. A host of adventurers and alleged spies were rounded up, the left-wing paper "Bonnet Rouge" was suppressed, and Louis Malvy, the Minister of the Interior since the first government of the *union sacrée*, was driven from office and put on trial before the Senate.

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48See Pershing's memorandum to Secretary of War Newton D. Baker. 15 November 1917, quoted in *My Experiences in the World War*, i, pp. 234-38. Pershing expected 217-265 German and Austrian divisions capable of offensive action to be ready for use on the western front by spring 1918, whereas the Allies possessed only 169 reliable divisions there in late 1917 (and only two of these American divisions); hence, the urgent need for many more American troops. In Pershing's memorandum of 2 December to the War Department (pp. 249-50), he predicted 250-260 German and Austrian divisions for the western front for spring 1918, and noted that several of the 169 Allied divisions had already been ordered to Italy.


50See Brogan, *France Under the Republic*, pp. 535-38. Bolo Pasha was shot, as was Mata Hari (in the moat outside the walls of the Chateau de Vincennes); the former editor of the "Bonnet Rouge" with the assumed name of Almeyreda was discovered strangled to death in his cell—John Terraine claims that Almeyreda's name "... is an anagram for 'y a la merde'--it's all shit'..." Go figure. See his *To Win a War: 1918, The Year of Victory*. (Garden City, NY: Doubleday & Company, Inc., 1981), p. 7. Malvy, distrusted by many for his shady friends on the left, was confronted by Clemenceau in the Senate on 22 July and accused of "betraying the interests of France," and he resigned at the end of August. See Bonnefous, *Histoire politique de la Troisième*
The commitment to *jusqu'au boutisme* was capped by Poincaré's call to
Clemenceau to form a government in November: "He had never been an amiable man and he had now so many enemies he cared little how many more he made. The acceptance of him by the Chamber was as much an abdication as the creation by the Convention, in 1793, of the Committee of Public Safety."\(^51\)

But the reinvigoration of the French government alone would not be enough to forestall defeat; hence, every pressure was brought to bear to hurry American soldiers to France, pressure applied by the French and British governments and their general staffs to Pershing and his staff in France and to the Wilson Administration in Washington, pressure to delay the creation of a complete American Expeditionary Force in favor of adding American infantry and machine gun units to French and British divisions. This policy of the "amalgamation" of American units into Allied divisions drove Pershing to distraction, yet time and again he had to relent either to pressure from Washington, or for fear that, otherwise, the Allies' position would be lost.\(^52\)

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\(^{51}\) *République*, ii, pp. 303-04. Thereafter, he was tried before the Senate, convicted of malfeasance and sentenced to five years' banishment in August 1918.

\(^{52}\) See Pershing, *My Experiences in the World War*, i, pp. 157-58, 255, 267-68, 272-73, 288; ii, pp. 6, 99, 219, 315-18. Clemenceau buttonholed Pershing in early September 1917, declaring "... that America had now been in the war several months and the French people were wondering when they expected to take an active part. ... He insisted then, as he did with even greater vehemence later in an official capacity, that it was not so much a question of troops being ready as it was of giving relief to the Allies." (i, p. 158) And as late as October 1918 Lloyd George, in a meeting with War Secretary Baker, complained "... that for all their [British] pains and sacrifices for training our troops there and equipping them they had gotten no good out of them.
The anticipated German offensive on the western front began in March and its first two assaults (21 March and 9 April) were directed against British forces in Picardy and Flanders. The first of these attacks posed an immediate threat to British supply depots at Amiens and the railheads at Abbéville, and, more than this, aimed at the detachment of the BEF from the French Army. The second, along the river Lys, was directed at Hazebrouck, a vital rail link between the BEF and the Channel ports. Both of these assaults possessed the additional benefit of drawing French reserves away from the front in Champagne, so offering the German Army one more opportunity to strike at Paris. That strike would come on 27 May when German troops would attack over the Chemin des Dames north of the Aisne river, and, reviving memories of the perils—and humiliating whatever, and that the American troops had not been of any service to the British." (ii, p. 315)

53 See above, note 32. It was the breakthrough towards Amiens that sparked the hastily called Anglo-French conference at Doullens on 26 March. Here it was finally decided that Foch would coordinate Allied forces on the entire western front. Haig acceded to the choice of Foch as he was desperate for French reserves to reinforce his lines, and the French sponsored Foch both for his commitment to the attack and to make an end run around the French commander-in-chief, Pétain, distrusted by all for his reluctance to commit troops to battle and for his invariably gloomy, and open, pessimism about Allied prospects. Poincaré records that before the session at Doullens, Clemenceau took him aside and spoke of Pétain: "Just think, he told me something that I would confide to no one else but you. These were his words: 'The Germans will thrash the English in the open country; after that, they will thrash us as well.' Should a general say, or even think, such a thing?" See Raymond Poincaré, Au Service de la France. Volume x: (Paris: Librairie Plon, 1933), pp. 87-90. On 3 April at the Allied Conference at Beauvais, Foch was "...entrusted with the 'strategic direction of operations'. The three national Commanders-in-Chief were to be under his orders with a right of appeal to their own Governments. And on April 14th the last step was taken; Foch was given the title of Commander-in-Chief." (Brogan, France Under the Republic, p. 501) A copy of the Beauvais communiqué, side by side in English and French, is reprinted in Pershing, My Experiences in the World War, i, pp. 376-77.
contingency plans--of September 1914, break through and once more threaten Paris.  

But this crisis still lay in the future. For a moment in the spring of 1918 any French citizen, certainly any French soldier, was entitled to a grim satisfaction; indeed, could indulge a self-esteem disdainful of allies as of enemies, justified by over three and a half years of extraordinary sacrifice and accomplishment: "No student of the French war-effort between 1914 and 1918 can help being filled with admiration. Against heavy odds--a dwindling population and inferior military preparation; within a generation of Sedan and the extortions of the Treaty of Frankfort . . . the people of France braced themselves for

54See Brogan, France Under the Republic, pp. 500-02; Cruttwell, A History of the Great War, 1914-1918, pp. 505-20; Liddel Hart, The Real War, 1914-1918, pp. 370-73; and Chastenet, Histoire de la Troisième République, iv, 308-315. This time, however, the French Government eschewed Bordeaux. The disheartening spectacle of the government's evacuation from Paris on the evening of 2-3 September 1914, had, by the following morning, achieved aspects of farce--"Bordeaux, for three days, appeared to be a conquered city." (Paul Courtelault, La vie économique à Bordeaux pendant la guerre. [New Haven: Yale University Press, n.d.], pp. 37-38)

The French Government, thus burdened with the legacies of 1870 and 1914, made plans to retreat to Blois and Tours. And not just government officials--Louis Loucheur, the Under-Secretary of State for Artillery and Munitions, estimated that 100,000 munitions workers who worked in the Paris region could be shifted to alternate locations (e.g., Bourges and Lyon) on two week's notice. See Poincaré, Au Service de la France, x. pp. 218-220.

Many people in Paris, however, did more than make contingency plans: "Unquestionably, people left Paris in March en masse. During the last week of March, the Gare de Lyon alone issued up to 20,000 tickets a day (more than double the usual number). Some train services had to be quadrupled. At Montparnasse there were 58,000 departures during the period 18-25 March, and 123,518 during 26 March-6 April." Only when the German offensive in Champagne ground to a halt in June did the traffic in the Paris stations begin to thin, and people begin to return. See Jean-Jacques Becker, The Great War and the French People. Translated by Arnold Pomerans. (Leamington Spa: Berg, 1985), pp. 311 and 315.
invasion, disaster and total war, with high courage and impressive solidarity."

David Thomson, *Democracy in France since 1870*. Fifth edition. (London: Oxford University Press, 1969), p. 179. This accolade has been expressed many times but the generous sentiment obscures the centrality of France's role in the conflict.

Time and again it was French commanders who refused to lose their composure. Consider Joffre's imperturbable nature (especially during the catastrophe of the first three weeks, and contrast this with von Moltke's nervous breakdown), his absolute refusal to permit his sleep to be disturbed no matter the circumstance (violated only during the initial assault on Verdun in February 1916, and then only by General de Castlenau); or consider Foch's telegram to Joffre in the midst of the first Battle of the Marne: "My center gives way; my right wing is folding up—situation excellent. I attack tomorrow." (Cruttwell, *A History of the Great War, 1914-1918*, p. 33) Pétain, on taking command at Verdun in the chaos following the initial attack, calmly addressed his troops: "Hold firm; I have confidence in you." (*Ibid.*, p. 247) And they did.

This *sang-froid* within the high command was matched by the resourcefulness and durability of French soldiers. One of the difficulties in approaching the First World War as a native speaker of English is that the British experience, because of its voluminous and eloquent expression in the imaginative literature, memoirs and studies of participants and historians, tends to obscure the French. Guy Chapman's memoir, *A Passionate Prodigality*, for example, is replete with allusions to the diction of the *Book of Common Prayer* and the Authorized Version; a work such as Wilfred Owen's "The Parable of the Old Man and the Young" goes further and baldly conflates the language of Genesis with images of the Great War. These works, like so many others, disguise the fact that, first and always, the lives, treasure and resources most prodigally spent were French. The BEF lost almost 20,000 killed as a result of the first day of the Somme offensive; the French Army lost 27,000 killed as a result of the engagements of 22 August 1914, during the Battle of the Frontiers. The infantry of Kitchener's "New Army" carried 66 pounds of equipment on the Somme; at Verdun, French infantry slogged through the mud alongside the *voie sacrée* (the road itself was ordinarily reserved for trucks and wagons hauling provisions, guns, ammunition and the wounded) carrying more than 85 pounds.

One is struck not so much that the French Army broke discipline in 1917, but that it did so with so little violence, and did not do it sooner. So Brogan: "It was from the land that there came most of the infantrymen who lived, fought, and died so hard. In Macedonia, where the English infantryman was so often at a loss, the tough French peasant from Auvergne or the Jura was soon as much at home as the Serbians or Greeks. . . . There were in 1914 many urban critics who thought that the peasant was pampered, by protection, by subsidy, by praise; . . . In peace-time, most of these charges could be justified, but in war-time the great fault of the French peasant was that he was now not numerous enough; there were not enough men to fill the ranks, not enough women to feed the nation in arms. Or rather, there were just enough, to hold out to the end." (*France Under the Republic*, p. 411)
This cuts closer to the truth than Thomson's fine words, but there is more. If French trenches were "nasty, cynical, efficient, and temporary," then they differed from thousands of French villages only in that they were temporary. Consider Pershing's recollection of provincial France: "The smaller French villages, which consist merely of groups of farmhouses, were not generally sanitary from our point of view, as the residue from the stables, regarded as invaluable fertilizer, was usually stored in the streets, where the unsightly heaps, with their pungent odors, reminded one of a country barnyard. At the expense of considerable labor on the part of troops, with such help from the French as could be impressed, most of the dumps had to be removed before our men were content to settle down to work." (My Experiences in the World War, i, p. 127.) Or this from the French Year Book: Statistical and Historical Annual of France for the Year 1919 (p. 285): "In the numerous small villages of the plateau he [the Lorrainer] lives in ordinary little cottages at the side of which is the barn, piles of quaintly-shaped logs of wood, his agricultural implements and great heaps of manure."

These villages contributed to the French Army young men whose martial habits and demeanor reflected this tumbledown domesticity. Foreign observers before the war were shocked at the casualness of French training—French infantry routinely walked instead of running during assault manoeuvres, were poor marksmen, billeted in town instead of bivouacking in the field, even read newspapers on the skirmish line. (See David G. Herrmann, The Arm in g of Europe and the Making of the First World War. [Princeton: Princeton University Press, 1996], pp. 82-83.) Such habits carried over into the war. In every sphere of military activity, in fact, the French soldier cut a poor figure beside his counterparts on the western front; he did everything less smartly than they—except fight and die.

One may respond that the western front was, after all, in France (and Belgium). But even here there is a caveat. This was not the France of the Second Empire—no French citizen on French soil saw the sun rise over the spires of Strasbourg. Nor was it the France of the Frankfort treaty—the northern tier of that France had been overrun by the end of August 1914—but truncated France, deprived of its most productive land in the manner and to the extent so cursorily described above. And whereas Imperial France survived two months before a German onslaught, this France, "rump France," with living (and very lively) memories of the Commune, of Boulanger and Dreyfus, of Church disestablishment, endured over four years. Examined with a cold, clear eye, it is still a remarkable achievement.

But there is more yet. One searches for a metaphor to describe the France of spring 1918, but can do no better than the trite one of the boxer—deep into a fight, exhausted and dazed by punches seemingly from every direction, standing with his arms draped over his cornermen awaiting the final round. But there is a catch even here—France was not leaning on her allies, but rather holding at least one of them up: "The AEF fought in France only because the French and British were able to furnish much of its supplies and equipment. American troops were especially dependent on foreign sources for artillery, ammunition, tanks, airplanes, and machine guns." (Timothy K. Nenninger,
The shortfall was not merely one of hardware: "It will be noted that over a year after we had entered the War [i.e., May 1918], we had contributed not a single man toward the movement of our troops and supplies over the sorely tried French railroads, not a man toward their track maintenance, only 60 per cent of the force required for the maintainence of equipment, and less than three-quarters of the men needed for discharging vessels." (William J. Wilgus, *Transporting the A. E. F. in Western Europe, 1917-1919*. [New York: Columbia University Press, 1931], p. 193)

Nor does the list end with military hardware or personnel. During the offensives of spring 1918 "... it became necessary to make provision for the hospitalization of our sick and wounded in an area where no American Expeditionary Forces hospitals existed. In this emergency the French were appealed to and permission was given by them to send our patients to Red Cross Military Hospital No. 1, in Paris. This was a most generous act on the part of the French inasmuch as it closed to them the best-equipped hospital in France. . . . While this was made as a temporary arrangement, it may be noted that this hospital from this time on, to the close of the war, received almost exclusively American patients." (Office of the Surgeon General of the United States Army. *Report of the Surgeon General, U. S. Army to the Secretary of War*. Two volumes. [Washington: Government Printing Office, 1919], ii, p. 1458)

The list also includes those items without which the war should have been unbearable for the ordinary soldier; from August 1918 to March 1919, for example, French companies delivered to the AEF and the Y.M.C.A. over 27 million pounds of candy, almost 9 million pounds of cookies and over 5 million pounds of jam--this in a country where the ingredients for each of these items were rationed by law. (See Office of the Surgeon-General, *The Medical Department of the U. S. Army*. vi, pp. 760-61.)

To make matters worse, the AEF too often did not take care of that which it received from its allies; the American neglect and abuse of horses and mules given or sold to it by the French government (which had itself to requisition these animals from French farm families burdened with a lack of manpower) created a scandal in the winter of 1917-1918--the AEF had arrived in France without a functioning veterinary service. See below, Chapter Four, and Lieutenant-Colonel Louis A. Merillat and Lieutenant-Colonel Delwin M. Campbell, *Veterinary Military History of the United States*. Two volumes. [Kansas City, MO: The Haver-Glover Laboratories, 1935], ii, pp. 677-720.

To the United States' credit, never before had such a complex military organization operated over such long lines of supply and communication, and the AEF did land thousands of disassembled automobiles, trucks and freight cars in France in 1917-18, to be reassembled principally at the supply depot at Montoir near Saint Nazaire. And the AEF was not the only army to arrive in France without a field veterinary service--the Germans had done the same in August 1914, with the result that "So bad were the arrangements made to feed the horses that some of the artillery teams died very early in the campaign,
There was, however, little time or opportunity for self-congratulation. In mid-April 1918 the Allies were faced with the task of preventing the disintegration of the BEF in the field. By 12 April British divisions had been so badly mauled that Haig issued his most desperate Order of the Day, requiring that "Every position must be held to the last man; there must be no retirement. With our backs to the wall, and believing in the justice of our cause each one must fight on to the end." Pershing had already assured Foch in sometimes even before the border into Belgium had been crossed. See Van Creveld, *Supplying War: Logistics from Wallenstein to Patton.* (Cambridge: Cambridge University Press, 1977), p. 125.

Still, the magnitude of the effort and the sacrifice is extraordinary, and should not be forgotten though the people who made them were so untidy, so stoic, so French. The sacrifices demanded of the nation by the First Republic in August 1793 had, at long last, been made good in full measure by the citizens of the Third.

This French capacity to endure, ironically, would do much to sour relations among the Allies in the last year of the war. So long as France shouldered the lion's share of the war's burden on the western front, Anglo-French relations remained civil; once that burden passed (temporarily) to the BEF in the summer and autumn of 1917, a burden for which the British were not, perhaps could not have been prepared, relations broke down amid mutual accusations of bad faith (a representative example of this sort of sniping appears below, pp. 51-52). As resentments festered between the European allies, each took out its frustrations on the Americans—for their late entry into the war, for their utter lack of preparation, for their seeming willingness to send over an army of stevedores, woodcutters and mechanics in lieu of real infantry, for their express desire to shape the peace settlement. Pershing, as noted above, whose previous assignment had been the pursuit of Pancho Villa back and forth across the Mexican border, provides ample evidence in his memoirs that at times he was simply overwhelmed by the entreaties and the intrigues of his allies.

There is a facsimile of the order printed in Churchill, *The World Crisis, 1916-1918,* ii, opposite p. 157. The last line—"But be of good cheer, the British Empire must win in the end"—was crossed out in pencil; no doubt it was too reassuring. Fussell has pointed out the irony that few British soldiers could have heard the order: "... one corporal noted: ‘We never received it. We to whom it was addressed, the infantry of the
late March that American troops were his to deploy for the duration of the emergency:
"Infantry, artillery, aviation, all that we have are yours; use them as you wish," but Foch
steadied British positions with only the meanest additions of French reserves.\textsuperscript{57}

Foch's policy of husbanding French troops for a future offensive led to a rancorous
Allied conference at Abbéville on 14 April; French troops, however, generally fought well
in this crisis. But on 18 April a fresh French division relieved an exhausted British one on
Mt. Kemmel, one of the highest (therefore, most strategic) points in Flanders.\textsuperscript{58} On the
25th, the French were driven from Mt. Kemmel, and "This lapse did nothing to improve
the relations between the two armies, at this time exceptionally bad. The French
complained that they were constantly being hurried up to pull the chestnuts out of the fire
for their incompetent allies. The countercharge of the British was that French promises of
conscerted attack seldom came off and never at the right time."\textsuperscript{59}

By the 29th of April, the crisis had passed. Mt. Kemmel remained in German

\textsuperscript{57}Pershing, \textit{My Experiences in the World War}, i, p. 365n. Note that the proffered
artillery, ammunition and aviation were entirely of French manufacture. And the
Americans were not the only ones to appreciate French engineering: "Although the
French Air Force was smaller than that of Germany, France led the world in aircraft
technology and even had supplied the Royal Flying Corps with all of its 113 planes. The
French rotary engines—the Gnôme and Le Rhône—were considered the world's best, and
even late into the war the Germans salvaged them from downed French aircraft to mount
them on their fighters." (Porch, "The French Army in the First World War," in Millett and

\textsuperscript{58}Cruttwell, \textit{A History of the Great War, 1914-1918}, p. 520.

\textsuperscript{59}Ibid., p. 521.
hands, but "... became one of the most disagreeable bits of the line, raked by converging
gun-fire and continually bombed," until its recapture in September. The Allies,
unknowing, still had a full month to prepare for the penultimate German offensive of the
war. Unnoticed in the midst of the April emergency, however, a signal event had
occurred. Between the 10th and 20th of April, at a camp and evacuation hospital at
Villers-sur-Coudun, just north of Compiègne, French troops of the 69th and 22nd
Territorial Regiments, along with those of the 18th Infantry Regiment, began to fall ill.
The Spanish 'flu had arrived in the French Army.

See A. Mignon, *Le service de santé pendant la guerre, 1914-1918*, iv, p. 729;
and Charles-Henri Dopter, *Les maladies infectieuses pendant la guerre: étude
hospital at Villers-sur-Coudun was attached to the Third Army in spring 1918 and
designated for treatment of the sick and victims of poison gas. With the French retreat
before the German offensive of 21 March, and the consequent loss of the surgically
equipped evacuation hospitals of Hargicourt, Dompierre, Tricot and Ressons, Villers-sur-
Coudun on 28 March was ordered to accept the walking wounded as well. See Mignon,
*Le service de santé pendant la guerre*, iii, p. 291-94. Once the 18th Infantry Regiment
moved back into the line, its place was taken by the 34th, which was soon joined by the
15th and 134th Infantry Regiments, and these three units were soon swamped with 'flu
cases as well.

There are a host of theories as to how the infection came to be known as the
Spanish 'flu: that the disease first appeared in Spain (it didn't); that it first appeared in
London after the arrival in that city of a Spanish ship (and, one assumes, dozens of other
ships on that particular day); that the King of Spain was among the infected. Not
surprisingly, it was reported soon after the pandemic that "The Spanish authorities
strongly maintain that the first epidemic wave of influenza that swept over Spain in May
and June 1918, was due to infection introduced from France. The French authorities on
the other hand as stoutly contend that France received its infection from Spain." (See
236.) The best of these stories, and one that reappears over and again in the literature,
runs that, as Spain was a neutral, its press was uncensored and the first notice of an
epidemic of influenza probably appeared there. Only a moment's reflection should serve to
Much about the influenza pandemic of 1918-1919 remains wrapped in mystery. The precise species origin of the infection is unclear; the geographic origin (or origins) of this, as indeed of most influenza epidemics and pandemics, is still a muddle; and most of all, the particular strain of type A influenza virus rampant in 1918-19 remains uncertain. What has become clearer in the intervening decades is the magnitude of the death toll. No visitation of disease in history, not Justinian's Plague, not the Black Death, nor any of the Eurasian infections introduced to the Americas in the sixteenth century, has killed so many people, nor killed them so quickly. The second, lethal wave of Spanish influenza killed, by a conservative estimate, at least 25-40 million people worldwide in the six months from August 1918 to January 1919.°

° See K. David Patterson and Gerald F. Pyle, "The Geography and Mortality of the 1918 Influenza Pandemic," Bulletin of the History of Medicine, 65 (1991), p. 15. This figure is almost certainly too low, especially considering the inability of statisticians to monitor the progress of the pandemic through the vast populations of east and south Asia, and the chaos prevailing in Russia following the outbreak of civil war in the summer of 1918. Patterson and Pyle point out as much: "In much of the world, officials had no
The pandemic struck virtually everywhere in the world. Only comparatively isolated islands—New Caledonia and St. Helena, for example—escaped infection.

Everywhere Spanish influenza respected neither season nor social class. The first wave of 'flu lasted from March to July; the second struck from August to January; only the third wave, from February to April 1919, observed the usual time constraints for 'flu season.

When influenza did strike, the wealthy were no more spared than the poor, for "The information on the number of deaths even in normal times, and certainly had only the most general notions about causes. Estimates of influenza mortality were often simply guesses by scattered, overworked doctors and administrators." (p. 13), and suggest a death toll as high as 39.3 million. On the other hand, the estimate of Stephen Pope and Elizabeth-Anne Wheal that the pandemic "... killed an estimated 70 million people worldwide in 1918-19," is, in the absence of new evidence, clearly over the top. See their *The Dictionary of the First World War.* (New York: St. Martin's Press, 1995), p. 240.

In the absence of better numbers, scholars of the pandemic have fallen back on those compiled by Edwin O. Jordan in his *Epidemic Influenza: A Survey.* (Chicago: American Medical Association, 1927), a work which drew upon the figures compiled by American and European epidemiologists and statisticians (in and out of government service) in the years immediately after the war. Jordan came up with a worldwide mortality figure of 21,642,283, of which deaths an estimated 12,500,000 occurred in India alone. More recent scholarship indicates that the death toll in India may have been much higher, possibly as many as 15-20 million. See I. D. Mills, "The 1918-19 Influenza Pandemic--The Indian Experience," *The Indian Economic and Social History Review,* 23 (1986). Howard Phillips' work on South Africa (*"Black October": The Impact of the Spanish Influenza Epidemic of 1918 on South Africa.* Archives Year Book for South African History; Fifty-third year, volume 1. [Pretoria: Government Printer, 1990]), and Geoffrey Rice's on New Zealand (*Black November: The 1918 Influenza Epidemic in New Zealand.* [Wellington: Allen & Unwin/Historical Branch, 1988]), also have resulted in higher mortality figures than those cited by Jordan. This study uses Jordan's figures as a point of departure, but resorts to revised figures for countries where these have become available. In any case, absolute numbers are of less consequence than influenza deaths as a proportion of population, and these ratios have tended to remain relatively stable across national boundaries precisely because of the general inflation in the statistics of absolute mortality.
mortality fell alike upon 'the sanitarily just and unjust.'

The one common denominator of every nation's experience of the pandemic, as apparent to contemporaries as to us, was the age-incidence mortality of Spanish influenza. Ordinarily an infectious disease leaves in its wake a U-curve of mortality—that is, it claims most of its victims from among the very young and the elderly. Yet everywhere in 1918, young adults ages 20-35 were at greater risk, and those seemingly most robust at greatest risk of all. Spanish influenza thus produced a W-curve of mortality—and in this way is eerily reminiscent of the first recurrence, in 1361, of the pestilence responsible for the Black Death of 1347-1351. Indeed, Sandra Tomkins concisely summarizes the predicament of any researcher confronting the blank face of Spanish influenza, arguing that "The extreme lethality of this [the second] wave has never been satisfactorily

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64 See Ministry of Health, Reports on Public Health and Medical Subjects No. 4: Report on the Pandemic of Influenza, 1918-19, pp. xiv, 44. Even this universal aspect of the pandemic will require further discussion below as all young people did not suffer alike—influenza mortality rates among soldiers at the front were, in all Allied armies, lower than those of soldiers stationed in rear areas. In the French Army, for example, 'flu mortality ranged from two to twelve times higher in units of the Army of the Interior than in the Army of the Northeast. See Huber, La population de la France pendant la guerre, p. 433; Mignon, Le service de santé pendant la guerre, 1914-1918, iv, pp. 729-31; and Office of the Surgeon-General, The Medical Department of the U. S. Army, vi, pp. 898, 1107.

explained by historians or epidemiologists. Given the global uniformity of the disease and the lack of any constant external factor across many climates, races, and socio-economic conditions, it is generally ascribed to the inherent qualities of the virus.⁶⁵

Historians have generally shied away from the study of influenza because, at first glance, it appears to offer little reward (and less grant money) for historical research. This is so because influenza suffers by comparison with more spectacular infectious diseases in important ways. First, of course, influenza rarely kills; a bout with ‘flu passes in a matter of days, leaving behind only a mild depression. As a result of the virus’s ability to recombine into new strains, and the limited immunity each exposure confers, one can contract the disease repeatedly throughout life. Hence, excepting the common cold, influenza is the most completely endemic of all infectious diseases. Unlike the traditional childhood diseases (measles, chickenpox, mumps, and so forth), influenza strikes all age groups, and the scope of individual infection is constrained neither by conditions of life (tuberculosis, leprosy), nor by season of the year (polio), nor by behavior (syphilis, AIDS). The influenza virus is always present in the human population, usually at the subclinical level, and hundreds of animal species—including over 100 species of birds—can harbor and/or suffer from the virus.

Second, influenza is accompanied by no startling symptoms and leaves in its wake neither disfigurement nor impairment. Influenza thus engenders none of the fear and

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⁶⁵ Sandra M. Tomkins, "The Failure of Expertise: Public Health Policy in Britain during the 1918-19 Influenza Epidemic." *Social History of Medicine*, v. 5, no. 3 (December 1992): p. 441. And there have been many and varied attempts to explain the pandemic, some of which will be discussed in the next chapter. As will be seen, none of these explanations has withstood careful scrutiny.
horror associated with the appearance of plague, smallpox, yellow fever or cholera.\textsuperscript{66} Influenza has inspired neither movements to improve public sanitation, as have the plague, yellow fever and cholera, nor campaigns to meliorate the health of the general public, as have smallpox, tuberculosis and syphilis.

Most of all, the very complexity of influenza's behavior--"Influenza is not a tidy or predictable disease, and those who attempt to label it and put it in a box do so at risk"--has served to discourage historical studies of the disease in favor of those that have been "solved."\textsuperscript{67} Thus there exists a vast literature covering plague, cholera, smallpox, malaria, yellow fever and syphilis, and a lesser but still substantial number of studies of tuberculosis, rabies, typhus fever and polio.

This neglect of influenza has persisted despite the fundamental shift in the nature of disease studies in the last two generations. Much early work in the history of medicine generally, and in the field of epidemic disease particularly, focused upon doctors and their study and gradual conquest of infectious diseases. Hence the ready identifications of Jenner with smallpox, Semmelweis with puerperal fever, Snow and Koch with cholera,


\textsuperscript{67} Kilbourne, \textit{Influenza}, p. 13.
Pasteur with rabies and Salk and Sabin with polio. These early histories of epidemic
disease too often indulged in whig history, or represented mere hagiography. The spread
of the new social history after the Second World War has switched the focus of disease
studies from doctors to patients, from the triumph of western medical science to the ways
in which communities have coped with and been transformed by disease. Among
historians (and anthropologists, epidemiologists, ethnologists and sociologists) who
pursue a structuralist approach, the new studies have concentrated upon gender, class or
racial conflicts: how did these groups respond to disease and how did they respond to
each other under the threat of disease? But the diseases under investigation have not
changed. The epidemics of Asiatic cholera that swept across Europe and the Americas
during the nineteenth century and once served as a backdrop for narratives of the gradual
triumph of western medicine over dread disease, now provide structuralist analyses with a
tidy trichotomy (before, during, after) useful in tracing the development of class, race and
gender conflicts.68

The influenza pandemic of 1918-1919, because of the complex nature of the virus,
has not served as such a neat exemplum. While the medical literature on influenza is
enormous—the *International Bibliography of Influenza, 1930-1959* (1978) alone lists over
7,000 titles—the historical literature has been scant. In the decades following the

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68 Two very different examples of this phenomenon appear in the cholera literature:
Evans, *Death in Hamburg: Society and Politics in the Cholera Years, 1830-1910*, and
François Delaporte, *Disease and Civilization: The Cholera in Paris, 1832*. Translated by

For an overview of this trend, see Toby Gelfand, "The *Annales* and Medical
Historiography: *Bilan et Perspectives,*" in Roy Porter and Andrew Wear, eds., *Problems
pandemic, the Spanish 'flu found, for the most part, anecdotal treatment in books devoted to the broader topics of the history of disease or historical epidemiology.69

Only since the 1970s has Spanish influenza begun to receive a fuller treatment from a more distant historical perspective. The most complete monograph on the subject appeared in 1976 with the publication of Alfred W. Crosby's *Epidemic and Peace, 1918.*70 This has been followed by a host of articles and books examining the pandemic of 1918-1919 from a local, regional or national perspective.71 But these historical studies of Spanish influenza, no matter how meticulously researched and argued, have remained mere descriptive accounts of the pandemic: who got sick when and where (delineated by groups according to age, sex, occupation and race), how vigorously government agencies pursued policies of quarantine or prevention, what therapies local and national medical authorities experimented with and recommended (and the popular acceptance of or


resistance to these policies and therapies), and, finally, who died (again analyzed by cohort). None of these works has established links among the microbiology, evolutionary biology and historical epidemiology of influenza, and historical research that skirts current biological and medical science is doomed to remain within the realm of mere description.

The following chapter will discuss the microbiology and epidemiology of influenza. The third chapter will examine the French experience of the pandemic, within the Army and the armies of its allies, and among the civilian population, in order to demonstrate that if France did no worse than any other state in combating the Spanish 'flu, neither did France do any better in its attempts to stem the tide or mitigate the effects of the pandemic. The discussion in the fourth chapter will include a recommendation for further research into the migration patterns of the Spanish influenza in wartime France. A brief conclusion will follow.
CHAPTER 2

THE MICROBIOLOGY AND EPIDEMIOLOGY OF INFLUENZA

The study of influenza reached a milestone in 1933 with the isolation of the virus at the National Institute of Medical Research in London. In the Institute's laboratories at Mill Hill, C. H. Andrewes, Patrick Laidlaw and Wilson Smith successfully inoculated ferrets with throat-washings from influenza patients--London was then suffering an epidemic--and transferred the disease back to a human subject.¹

¹The human subject was, ironically, Wilson Smith--he contracted influenza after a ferret sneezed in his face. This strain of type A influenza is still identified as "WSN." Edwin Kilboume noted in 1987 that the history of this original strain of isolated virus "... illustrates not only the hundreds of laboratory passages that it has undergone but the variety of host tissues in which the virus has replicated since leaving the respiratory tract in man in 1933... This virus, long used in genetic studies... defies conventional classification, and, indeed, few working with the virus today know its exact history." See his Influenza, p. 28.

Type B influenza was discovered in 1940, and type C identified in 1947. As neither type B nor C exists in any save the human population, and as neither produces more than a mild case of 'flu (neither has ever been isolated during a pandemic), this study will concentrate on type A. See Edwin D. Kilbourne, "The Influenza Viruses and Influenza--An Introduction," in Edwin D. Kilbourne, ed., The Influenza Viruses and Influenza. (New York: Academic Press, 1975), pp. 5-7.

For narratives of the original isolation, see Williams, Virus Hunters, pp. 213-14; Crosby, America's Forgotten Pandemic, pp. 285-89; and Sir Macfarlane Burnet, Changing Patterns. (Melbourne: William Heinemann, 1969), pp. 122-24. The ferrets, unlikely experimental subjects, had been gathered for distemper experiments. Because ferrets exhibit influenza symptoms so readily and unambiguously, they still serve as experimental subjects in influenza studies.
Thus ended over three centuries of speculation as to the cause of influenza. The disease had been known in Europe since at least the twelfth century (and no doubt was much older) under a variety of names—the ague, epidemic coughs, catarrhal fever, le courier, la grippe, l'horion, die Blitz Katarrh—but only in the eighteenth century was it recognized as a specific disease, and only in the early nineteenth century did the Italian term influenza achieve widespread usage. The impetus behind the more rigorous influenza studies of the early modern period lay in the increasing number of epidemics that had plagued the growing populations of European cities since the seventeenth century—in Great Britain alone, epidemics of influenza erupted a dozen times in the eighteenth century. The greater prevalence of influenza, and its increasing acceptance as a specific disease, made the study of influenza a logical pursuit for the eighteenth-century epidemiologist.

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Kilbourn points out that "the credibility of historical records is, in general, inversely proportional to their antiquity. With influenza, remote observations are clouded not only by temporal distance but by a background of poxes, murrains, plagues, agues, pestilence, and famine that often obscured the perception of influenza as a distinct and specific entity." See his Influenza, p. 3. Margaret Delacy adds that "in the seventeenth century, influenza was still confused with so many other diseases and was called by so many different names that it was nearly impossible for doctors to compare notes, or to develop a useful etiology." See her "The Conceptualization of Influenza in Eighteenth-Century Britain: Specificity and Contagion." Bulletin of the History of Medicine, 67 (Spring 1993): p. 84.


Patterson notes that the epidemics of 1729-30, 1732-33, 1781-82 and 1788-89 were also pandemic in scope. See his Pandemic Influenza, 1700-1900, p. 83.
disease, naturally accelerated the inquiry as to its cause. Thomas Sydenham (1624-89)
argued that epidemics of disease resulted as "... subterranean effluvia generated disease-
causing miasmata when they came in contact with 'corpuscles' in the air." This miasmatic
theory of disease origins gave rise to the concept of "epidemic constitutions," the notion
that soil poisons released into the atmosphere worked in combination with "... the
perceptible physical qualities of the atmosphere and season" to produce conditions (i.e.,
the epidemic constitution) fostering the spread of a dominant affliction in any given year.

This theory of disease origins appeared all the more plausible in light of the woeful
state of public sanitation in pre-twentieth century cities and towns--only recall Swift's "A
Description of a City Shower" or the mordant observations of mid-nineteenth-century
Paris (and Parisians) recorded in Tocqueville's Recollections. Beginning in Great Britain
in the 1830s, however, the public sanitation movement and compulsory vaccination would
largely eradicate cholera and smallpox in western Europe by the end of the century. The
revolution in bacteriology that began in the century's last quarter--notable for Pasteur's
work on anthrax and rabies, Koch's with anthrax, tuberculosis and cholera and Lister's

221. For details of the various miasmatic theories of disease current during the early
modern period (Sydenham's was only one of many), see James C. Riley, The Eighteenth-

5Delacy, "The Conceptualization of Influenza," p. 79. These qualities included heat,
cold, moisture and dryness, and these reflected the traditional humors of the body
associated with Hippocratic medicine (derived from Hippocrates' Air, Waters and Places):
hot or cold, moist or dry. Hence, Delacy adds, the miasmatic theory can be best described
as 'neo-Hippocratic.' (Ibid.) See also Macfarlane Burnet and David O. White, Natural
History of Infectious Disease. Fourth edition. (Cambridge: Cambridge University Press,
contributions to surgical asepsis and antisepsis—largely completed the triumph of the contagious theory of disease over the miasmatic.\(^6\)

Still, there were prominent holdouts. Max von Pettenkofer, the Director of the Institute of Hygiene in Munich, was one, as was the talented amateur British epidemiologist, Charles Creighton.\(^7\) But the ability of microbiology to produce research opportunities and knowledge—if not always results—drove the miasmatic theory of disease causation from most medical schools and professional journals within a generation.\(^8\)

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\(^6\)The work of Pasteur, which began with proofs against the possibility of spontaneous generation and the investigation of yeasts in the 1860s, and culminated with the production of a rabies anti-toxin in 1885, is well known, as is that of Koch with cholera and tuberculosis. For a concise summary of their work, along with that of Lister, see Magner, *A History of Medicine*, pp. 297-328.

The crucial innovations of the germ revolution, however, were technological: 1) the use of the Petri dish (named for its inventor, Richard Julius Petri, the curator of the University of Berlin Institute of Hygiene) filled with agar-agar, a seaweed derivative, to grow pure cultures of bacteria; and 2) the employment of aniline dyes to stain the cultures, and thereby permit investigators to isolate and trace the growth of various bacteria. (*Ibid.*, p. 318) This technology produced modern bacteriology, and provided the link between the micro- and macrobiology (i.e., epidemiology) of disease that has endowed twentieth-century medical science with so much apparent explanatory power.


Pettenkofer was such a determined anti-contagionist that, during the epidemic of 1892, he drank of a solution containing cholera bacilli (received from one of Robert Koch's assistants in the Epidemiological Institute in Hamburg) and, suffering only minimal gastric distress over several days, survived. Creighton was equally stubborn, going so far as to defend miasmatism through appeal to Darwinian theory, arguing that as conditions (i.e., epidemic constitutions) changed, so some diseases would be favored over others, the latter of which should thereafter disappear. See *ibid.*, pp. 314-15.

\(^8\)But not, of course, from the minds of many, particularly older, general practitioners. See Patterson, *Pandemic Influenza*, p. 50. Tuberculosis was the most prominent failure for early bacteriology—Koch's tuberculin therapy proved to be useless, and it was not until
Influenza, in an ironic way, played a role in the victory of specific contagionism.

The pandemic of 1889-1892 produced the first systematic laboratory investigations of influenza, and in the autumn of 1891 Richard Pfeiffer of the Institute for Infectious Diseases in Berlin isolated what he thought to be the culprit—the bacterium \textit{H. influenzae}.\textsuperscript{9} The assumption that \textit{H. influenzae} was the source of influenza infection persisted into the 1920s, but this assumption was always surrounded by doubt, based upon the inability of researchers to satisfy Koch's Postulates. During the pandemic of 1889-1892, Pfeiffer was unable to inoculate laboratory animals, save in massive doses, with the bacterium, nor could \textit{H. influenzae} always be recovered from sputum samples of apparent influenza sufferers, either during the pandemic or during the interpandemic years, 1893-1918.\textsuperscript{10} It was not until 1947 that Selman A. Waksman's antibiotic, streptomycin, provided the first effective treatment for \textit{Mycobacterium tuberculosis}. See Magner, \textit{A History of Medicine}, pp. 321-26, and Thomas McKeown, \textit{The Origins of Human Disease}. (London: Basil Blackwell, 1988), pp. 79-80.

\textsuperscript{9}See Crosby, \textit{America's Forgotten Pandemic}, pp. 269-70. For many years thereafter this bacterium was referred to as Pfeiffer's bacillus. Pfeiffer had joined the Institute in 1887, and became a Professor of Hygiene at the University of Königsberg in 1899. He did bacteriological work on a number of diseases besides influenza, including cholera, typhoid and malaria, and achieved the rank of general while serving with a hygiene unit in the German Army during the Great War. See William Bulloch, \textit{The History of Bacteriology}. (London: Oxford University Press, 1960), pp. 390-91.

For the most complete examination of Pfeiffer's bacillus as a suspected cause of influenza, see R. Donaldson, "The Bacteriology of Influenza: With Special Reference to Pfeiffer's Bacillus," in F. G. Crookshank, ed., \textit{Influenza: Essays by Several Authors}, pp. 139-295. This simple bacterium is also the first to have its entire DNA sequence recorded—a chain of 1,830,121 DNA bases. See the \textit{New York Times} (26 May 1995): pp. A1, A7, and the \textit{New York Times} (1 August 1995): pp. B5, B9. Note that these articles mention neither Pfeiffer nor the influenza pandemics of 1889-1892 and 1918-1919.

was the pandemic of Spanish influenza, however, that did most to discredit Pfeiffer's hypothesis. During the pandemic, thousands of samples were examined (sputum samples taken from patients, lung sections taken post-mortem) and *H. influenzae* appeared in only 35.1% of all cases.\(^{11}\)

The decisive failure of Pfeiffer’s bacillus to prove out as the causative agent of influenza in 1918-1919 threw the rapidly expanding world community of influenza researchers into confusion. Some resuscitated old theories in the search for a solution. F. G. Crookshank concluded in 1922 that "... the great pandemics of influenza are not isolated phenomena, but are each part of a series of organised disturbances of health spread over what I call an influenza period: a period during which there obtains ... a special 'epidemic constitution': a period lasting, roughly, for the whole world some five years or so."\(^{12}\) Other researchers refused to abandon the microbial theory of influenza, and turned instead to the second "wave" of the germ revolution for a solution. Koch himself had anticipated this possibility in a lecture in 1890: "We know almost nothing about the disease agents of influenza, whooping cough, trachoma, yellow fever, Rinderpest, Lungenseuche, and many other undoubtedly infectious diseases. . . . I suspect that these diseases involve organized disease agents that are not bacteria but rather belong

\(^{11}\)See *Ibid.*, p. 162. This lab work was done primarily in North America and Europe, with most of the tests performed in the United States.

to completely different groups of microorganisms." These microbes were, of course, the viruses. John Buist, a bacteriologist at the University of Edinburgh, was the first to see a virus (that of cowpox) through a microscope, in 1887. But as he could not cultivate the particle on agar, nor transmit any infection, he failed to realize the significance of his discovery. Within ten years, however, the botanist Martinus Beijerinck and bacteriologist Dmitrii Ivanovski had, in independent researches, discovered the tobacco mosaic virus and, employing porcelain filters, proved that this microbe was many magnitudes smaller than all but a few bacteria.

Their work was followed quickly by that of Friedrich Loeffler and Paul Frosch, who identified the virus of foot-and-mouth disease in 1898, and Walter Reed's discovery of the yellow fever virus in 1901. Yet it must be remembered that these early investigators did not think of their virus[es] in modern terms; they believed that the infectious agent

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14 See Williams, Virus Hunters, pp. 69-70.

15 See Ibid., pp. 73-84. The porcelain filter, to that time, had never failed to trap any bacterium; hence, in the early years of virology, viruses (this was the term Beijerinck used in his 1898 paper on tobacco mosaic) were referred to as "filterable viruses."

Beijerinck and Ivanovski were not the first to search for a microbial source for tobacco mosaic--Adolf Mayer had conducted experiments on diseased tobacco plants in 1886, concluding that "... his microbe must be a very unusual bacterium." (Magner, A History of Medicine, p. 329) Beijerinck himself at first believed his filtrate to be without definite structure, "... an infectious principle of a completely fluid nature." (Williams, Virus Hunters, p. 83)
was a special small microbe, rather than a fundamentally different entity. Not until the 1930s did electron microscopes produce the discovery that viruses possess a structure and reproductive cycle entirely different from those of the bacteria.

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16Magner, A History of Medicine, p. 330.

17See Ibid., pp. 330-31. Viruses, at best, constitute a marginal life form, surviving, even thriving "... somewhere in that hazy region between living creatures and inanimate objects." (Arthur M. Silverstein, Pure Politics and Impure Science: The Swine Flu Affair. [Baltimore: The Johns Hopkins University Press, 1981], p. 50.) In its essence, a virus is "... a structure composed of a protein coat surrounding a nucleic acid molecule, either RNA or DNA, which is capable of replication only within living cells. A virus is not an organism; it has no metabolism and is wholly dependent for its reproduction on mechanisms provided by its host cell." See Burnet and White, Natural History of Infectious Disease, p. 53. Robert Augros and George Stanciu add that "Viruses prefigure certain life functions and are considered by some to be rudimentary living things. Closer inspection, however, indicates otherwise. Viruses carry out no true life activities." (The New Biology: Discovering the Wisdom in Nature. [Boston: New Science Library, 1987], pp. 40-41) In short, viruses do not eat, metabolize, grow (or grow old) and "... have the machinelike capacity of being disassembled and reassembled without loss." (Ibid., p. 41) Moreover, "Some of them can even be crystallized, like minerals. In this state, they can survive for years unchanged—until they are wetted and placed into contact with their particular hosts." (See Lynn Margulis and Karlene V. Schwartz, Five Kingdoms: An Illustrated Guide to the Phyla of Life on Earth. Second edition. [New York: W. H. Freeman and Company, 19--], p. 16.) Viruses, therefore, are often referred to as "biologically active particles."

An ancillary but interesting question raised by viruses concerns their origin. Despite their simple structure, they almost certainly could not have evolved before the bacteria—as viruses are entirely parasitic and must make use of another organism's reproductive mechanism, bacteria must have evolved before them. This leaves two possibilities—that "... viruses arose by a process of parasitic degeneration ..." from among the bacteria, or that viruses are the descendants of "renegade DNA"; hence, the product of "cell mutiny." See Ibid., pp. 65-67. See also Aidan Cockburn, The Evolution and Eradication of Infectious Diseases. (Baltimore: The Johns Hopkins University Press, 1963), p. 26.

Cockburn himself, in a view now out of favor, thought viruses "... may possibly be a kind of mobile gene, playing a vital part in the survival of their [host] cells." (Ibid., p. 68) Margulis and Schwartz suggest that viruses bear a closer relation to their hosts than to each other: "They may have originated as nucleic acids that escaped from cells and began replicating on their own—always, of course, by returning to use the complex chemicals and structures in their former home cells. Thus, the polio and flu viruses are
Richard E. Shope was one of those who, in the wake of the failure of Pfeiffer's bacillus to solve the riddle of influenza, turned to the laboratory where he, quite by accident, stumbled onto an answer among the viruses. Shope began his work on "hog 'flu" in Iowa in the autumn of 1928 (the disease had first appeared in the American Midwest in late summer 1918), and almost immediately isolated *H. influenzae* from sick hogs. Yet in the year that followed, he could only pass hog 'flu from one animal to another "... if he took crude lung suspensions or bronchial secretions from infected pigs. . .," and, therefore, found himself back at square one: "'We were,' wrote Shope, "'at this stage of the game, in almost the identical predicament ... that investigators of human influenza had been at the close of the 1919 [sic] pandemic regarding the Pfeiffer bacillus. We had an organism ... regularly present in the disease ... but... it failed to produce the disease.'" ¹⁸

¹⁸Quoted in Williams, *Virus Hunters*, p. 206. Williams claims that hog 'flu appeared for the first time anywhere in the world in August 1918 in western Illinois, then "... caused serious losses at the National Swine Breeders' Show at Cedar Rapids, September 30-October 5, 1918." *(Ibid.,* p. 204) This is an important point in that people in France had begun to suffer from the second, lethal wave of Spanish influenza before the appearance of hog 'flu in the United States. Moreover, while the United States exported over 1.5 billion pounds of pork to its European Allies during 1918, there is no indication in the record of the export of live hogs to Europe. See Frank M. Surface, *American Pork Production in the World War*. (Chicago: A. W. Shaw Company, 1926), p. 56.

It is likely, therefore, that the pandemic of 1918-1919 could not have been swine in its species origin, but rather that influenza passed from the human to the hog population during the pandemic. This conclusion would help account for the fact that "The swine flu virus which caused the 1918-19 pandemic was extraordinarily virulent, while the swine flu strains which reappeared periodically during the 1920s were far less virulent, and caused a much lower mortality rate." (Silverstein, *Pure Politics and Impure Science*, p. 59), and agrees with the observation of Robert G. Webster and W. Graeme Laver that "... it is likely that the virus [of 1918-1919] was transmitted from man to pigs rather than in the
By 1931 he had induced mild cases of what appeared to be influenza in experimental pigs with a "bacteria free filtrate," derived from bronchial samples taken from his pigs. As swine influenza (a term of Shope's coinage) had appeared simultaneously across the American Midwest each autumn since 1918 and "Hogs live in crowds, but do not travel except on their one-way trip to market," Shope began to suspect the presence of a multi-cycle parasite.19

Shope's work has largely been forgotten because it has since been proved that swine influenza can thrive without benefit of his pig-lungworm-angleworm cycle, because there has never appeared any convincing evidence for a synergistic relationship between swine influenza and *H. influenzae*, but primarily because Andrewes, Laidlaw and Smith isolated the influenza virus in the midst of Shope's experiments. There exists in every other direction." See their "Antigenic Variation of Influenza Viruses," in Kilbourne, ed., *The Influenza Viruses and Influenza*, p. 273.

Macfarlane Burnet agrees with this conclusion: "Pandemic flu hit America at Boston early in September 1918 and spread rapidly, reaching Iowa just as the Cedar Rapids Swine Show was being held. At the show many of the swine on exhibition became ill, some fatally, with a previously unrecognized malady. Almost inevitably it was ascribed by the pig farmers to infection from persons with pandemic influenza and has been known since then as swine influenza or hog-flu," and adds that "... most virologists are probably willing to accept Shope's contention that the farmers were right." See his *Changing Patterns*, p. 124.

19Ibid., pp. 207-08. Shope's cycle for swine influenza was a bizarre construction: A pig inhales lungworms while rooting; the influenza virus, already present in the animal's lungs, invades the eggs of lungworms; the pig coughs up eggs and swallows them, then defecates them onto the soil where angleworms ingest the eggs; rooting pigs eat the angleworms and, from the pig's stomach, the lungworm larvae migrate through the bloodstream back to the lung.

This would account for the periodicity of swine influenza, but Shope further claimed that swine 'flu only achieves real virulence in the presence of *H. influenzae*. This is the synergistic relationship between the two microbes that has been endorsed by Crosby, the synergism referred to in the Introduction.
branch of western science, and seemingly always has, a powerful bias towards simplicity.

Shope's hypotheses and experiments were clever and imaginative, but his theories have always seemed too speculative and unnecessarily complex to be entirely credible. Nevertheless, his work served as a useful "... bridge between the earlier era of influenza research, when bacteria as represented by Pfeiffer's bacillus were regarded as the transmitter of human influenza, and the present period, when the virus is almost universally recognized as the assassin."

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The isolation of the virus in London in 1933, therefore, opened a promising new era of influenza research, one enhanced by the research opportunities presented by the pandemics of Asian influenza in 1957, Hong Kong influenza in 1968 and the still-born swine 'flu epidemic of 1976. These six decades of study and experiment have produced a sophisticated microbiology of influenza, as well as a precise nomenclature of the various strains of the virus.

Influenza is a helical orthomyxovirus with a diameter in the range of 80-120 nanometers. The structure of the influenza A virus particle is comparatively simple: the

\[ \text{Influenza, p. 237. Nor, according to Kilbourne, has the influenza virus ever been isolated from the lungworm.} \]

\[ \text{Gray, The Advancing Front of Medicine, p. 179.} \]

\[ \text{See Purnell W. Choppin and Richard W. Compans, "The Structure of Influenza Virus," in Edwin D. Kilbourne, ed., The Influenza Viruses and Influenza. (New York:} \]

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eight-segmented, single-stranded RNA of the virus is covered with a protein coat (the capsid), enclosed within a two-layered membrane (the lipid bilayer) composed of proteins, and the membrane is covered with two kinds of spike-like structures, the hemagglutinin and the neuraminidase. These spikes are the most prominent, and most comprehensively studied feature of the virus. They are, in ways still not entirely clear at the level of molecular analysis, crucial to its infectivity and successful reproduction. Hemagglutinin spikes are the better understood (they ordinarily outnumber those of neuraminidase by a factor of five), and are employed to adhere to ("adsorption"), fuse with and gain entry to host cells. As the hemagglutinin constitutes the greater portion of the virus's surface morphology, it is the feature by which antibodies recognize the virus. The function of the neuraminidase is murkier, though it appears to play a role both in the release of new virus particles.

The designation orthomyxovirus refers to "... the Greek word orthos for 'straight or correct' and another Greek word, myxa, for 'mucous,' with an Italian form of the Latin influenza." (Kilbourne, Influenza, p. 26) The 'flu virus particle frequently appears filamentous in shape (though these virions are more often encountered in nature--the virus, particularly in the laboratory, routinely assumes the spherical shape). A nanometer (nm) is one-billionth of a meter. The size of the influenza virus places it in the mid-range of the viruses--smallpox is more than twice as large, the poliovirus several times smaller. See Kilbourne, Influenza, p. 35, and Burnet and White, Natural History of Infectious Disease, p. 55.


Like the rabies virus, influenza A is a "minus strand virus," one of those which "... encode their messages as minus strands of RNA. Inside a cell, minus strands must be transcribed into complementary plus strands before viral replication can begin." (Manfred Eigen, "Viral Quasispecies," Scientific American, v. 269, no. 1, (July 1993): p. 42.
particles from host cells ("viral budding"), and in their subsequent dispersal and search for new host cells.  

The variation in the composition of the virus, most noticeable in the hemagglutinin and neuraminidase spikes, results from either genetic drift or shift. Influenza undergoes genetic drift when one or more point mutations appear along the virus's genome—and this happens with far greater frequency among RNA viruses than among DNA viruses. Genetic shift ("reassortment") involves wholesale changes in the genome of the virus.

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As do other viruses, influenza exhibits cell tropism, (i.e., the ability to invade only certain types of cells), which permits influenza virions to attach to the endothelial cells that line the respiratory tract. (See J. Heritage, E. G. V. Evans and R. A. Killington, *Introductory Microbiology.* [Cambridge: Cambridge University Press, 1996], p. 62.) These conclusions are much simplified and subject to revision, especially in the case of the neuraminidase. The literature on the molecular biology of the influenza virus is highly complicated, and a technical discussion of the virus's molecular biology lies outside the scope of this study. See Irene T. Schulze, "The Biologically Active Proteins of Influenza Virus: The Hemagglutinin," and D. Bucher and P. Palese, "The Biologically Active Proteins of Influenza Virus: Neuraminidase," both in Kilbourne, ed., *The Influenza Viruses and Influenza,* pp. 53-123. For more recent summaries, see Kilbourne, *Influenza,* Chapter 3: "Viral Structure and Composition," pp. 33-51, and pp. 73-74, and "How a Flu Molecule Stands on Its Head to Infect Human Cells," *New York Times* (6 September 1994): p. B6, and Eigen, "Viral Quasispecies."

Better introductions for the layperson, though now somewhat out of date, are Martin M. Kaplan and Robert G. Webster, "The Epidemiology of Influenza," in *Scientific American,* v. 237, no. 6 (December 1977): pp. 88-106, and Arthur M. Silverstein, *Pure Politics and Impure Science,* Chapter 6: "Influenza, the Impure Science."

This occurs because, as RNA viruses cannot proofread their genetic codes, they cannot "... remove misincorporated bases from newly synthesized RNA strands." Hence, these mistakes occur far more often than with DNA viruses—100,000-1,000,000 times more often. This permits RNA viruses "... to exceed average rates of evolution of their DNA-based hosts by factors of millions." See Kilbourne, *Influenza,* p. 115, and John Holland, "Replication Error, Quasispecies Populations, and Extreme Evolution Rates of RNA Viruses," in Stephen S. Morse, ed., *Emerging Viruses.* (New York: Oxford University Press, 1993), p. 209.
producing in effect an entirely new strain, one the result of the hybridization of two or more strains of the virus.26

The alterations in the morphology of the virus resulting from changes in its genome are used by researchers to designate various types of the influenza virus. Thus there have been recorded for the influenza A virus fifteen hemagglutinin subtypes (designated H1-H15) and nine for neuraminidase (N1-N9). These designations, always listed in tandem, refer to pandemic categories of the virus. The particular virus responsible for the pandemic of Asian 'flu in 1957, for example, is designated H2N2, and all subsequent 'flu epidemics were of this type until influenza underwent another genetic shift, producing the H3N2 virus responsible for the pandemic of Hong Kong 'flu in 1968.27

See Kilboume, *Influenza*, pp. 119, 124. Kilboume points out that this new strain of influenza A really is a new virus: "In a sense, influenza A viruses of different HA [hemagglutinin], NA [neuraminidase] subtypes can be considered 'antigenic variants' within a common family of viruses probably derived from a common evolutionary ancestor." Moreover, Kilboume adds, these hybrid strains are not merely laboratory creations: "Evidence is now strong that reassortment of HA and NA genes occurs in nature, creating 'antigenic shifts' leading to the emergence in the human population of viruses with apparently novel antigens." (Ibid., p. 124)

Indeed, the difference in the results of these genetic processes likely accounts for the difference in range found in epidemics and pandemics.

Marc Lappé claims that in engaging in such radical genomic shifts, the influenza so expands its genetic range that it risks its own survival: "Populations of RNA viruses, such as those causing AIDS and influenza, actually have 'maximally tolerable' rates of mutation. That is, their rates of genetic change from generation to generation are so great that it is right at the cusp of survival. With multiple genetic changes the rule in each generation, the flu and AIDS viruses constantly risk compromising their ability to make new viable types." (Evolutionary Medicine: Rethinking the Origins of Disease, p. 44)

27 See Table 9-1 in Kilboume, *Influenza*, p. 230, for a list of the subtypes under the present and former nomenclatures; see also Beveridge, *Influenza: The Last Great Plague*, Table 3, p. 76. The subtype responsible for the pandemic of 1918-1919, formerly designated Hsw1N1, is now denoted H1N1. The majority of the strains of influenza A identified to date are not infective for human beings--clinical evidence exists for human
The ability of influenza to alter its surface proteins, and thereby elude detection by the immune system, renders impossible the production of one, reliable vaccine. Each year’s outbreak of ‘flu requires laboratory tests to determine subtype and strain before production of a "killed virus" vaccine can begin. The time consumed by this process of infection by hemagglutinin subtypes H1-H3 and neuraminidase subtypes N1, N2 and N8—but cause disease among other species, especially migratory waterfowl. There has appeared only recently (the summer of 1997) the first solid evidence that avian influenza—in this case, a strain of H\textsubscript{5} in Hong Kong—can infect people. See Brian Murphy, "Factors Restraining Emergence of New Influenza Viruses," in Morse, ed., Emerging Viruses, p. 238, and Malcolm, "The Dead Zone," The New Yorker (29 September 1997): p. 64.

Individual strains of the virus isolated in the laboratory (i.e., epidemic strains of pandemic types), however, are designated according to: 1) Type of influenza (A or B); 2) place of isolation; 3) isolate number (that is, the attempt to isolate the virus that ultimately proved successful); and 4) year. The swine ‘flu that appeared at Ft. Dix in January, 1976, for example, is designated A/New Jersey/8/76. In this nomenclature, the original influenza isolation, termed WS or WSN, would read A/London/1/33.

It was once thought that influenza subtypes could not coexist—that the new always displaced the old—but the reappearance of the H\textsubscript{1}N\textsubscript{1} swine ‘flu in the mid-1970s did not herald the passing of the H\textsubscript{3}N\textsubscript{2} subtype; indeed, H\textsubscript{3}N\textsubscript{2} strains of influenza remain dominant in the 1990s, as they have been since their appearance in 1968. See Kilbourne, Influenza, p. 167.

There also exists good evidence that influenza subtypes recycle themselves: "Those individuals born before 1889 possessed antibodies [in tests of their blood] specific for the H2 antigen, which only reappeared during the pandemic of Asian influenza in 1957 (H2N2), while people born before the influenza epidemics of 1900 possessed antibodies against the H3 antigen, which did not reappear until the Hong Kong flu pandemic of 1968 (H3N2)." (Silverstein, Pure Politics and Impure Science, p. 55)

28Vaccines can be made from similar but less dangerous viruses, as with the cowpox vaccine for smallpox, with attenuated (i.e., weakened) virus, or dead virus particles. This latter method works for influenza as antibody receptors bind to the hemagglutinin spikes preparatory to killing the virus; hence, the configuration of the HA spikes is more important than whether the virus is alive or dead.

Influenza susceptibles can now be immunized with a "subunit vaccine," in which "Inoculation of individuals with purified haemagglutinin molecules, or fragments generated from such molecules causes the production of antibodies against the haemagglutinin, and these afford the immunised person protection from infection with influenza virus." (See Heritage, et al., Introductory Microbiology, p. 67.)
subtype and strain identification, clinical trials, vaccine production and distribution
requires that public health services must act quickly to forestall an epidemic with an
immunization program. ²⁹

Here is the essence of the difficulty with influenza. The knowledge of its
microbiology accumulated through medical research since 1933 has not been matched by
similar achievements in the understanding of its epidemiology; indeed, the epidemiology of
influenza remains the most baffling aspect of this inscrutable disease. In this, influenza
stands apart. Robert Koch's identification of the "comma bacillus" as the agent of cholera
in 1884 pointed the way only a few years later to the experiments that confirmed the water
supply as its usual vector.³⁰ So also the identification of the tubercle bacillus confirmed
that tuberculosis was a contagious disease most readily transmitted through personal

²⁹Even this may not suffice. The United States Public Health Service made its first
attempt to mount a large-scale influenza immunization campaign in 1957, only to discover
that a number of corporations bought up entire lots of vaccine for the benefit of their
employees, and that entire sections of the United States were left with no access to the
vaccine whatsoever. See Williams, Virus Hunters, pp. 228-35, and Silverstein, Pure
Politics and Impure Science, pp. 14-16.

The swine 'flu immunization program of 1976, created under urgent pressure
because of the reappearance of an H1N1 virus, fared no better. The Ford Administration,
with a Congressional appropriation of $100,000,000, committed itself to large-scale
production and distribution of a vaccine that killed and paralyzed an inordinate number of
recipients, in preparation for an epidemic that never materialized. See Ibid., passim.

³⁰Koch's "... observations in Calcutta and his own experiments confirmed his belief
that the cholera bacillus survived best, indeed multiplied most rapidly, in water, including
drinking-water." (Evans, Death in Hamburg, p. 267) The studies that confirmed water as
the ordinary vector of cholera were conducted by Koch in Hamburg and its suburbs during
the epidemic of 1892.
The entire range of influenza's means of transmission, however, is still uncertain. The virus is most readily communicated by expelled droplets, person to person. It can also survive in an evaporated state on dust, and as droplet nuclei—particles of virus within expelled droplets so small that their moisture rapidly evaporates, leaving the virus particle suspended in the atmosphere. This permits aerosol, as well as direct contact infection. Once a person is infected, the disease has an incubation period of from one to seven days, and a 'flu sufferer can shed infective virus for three to four days after the onset of symptoms.

This much is known, but cannot account for a number of puzzles connected with the spread and virulence of influenza, especially for the pandemics before 1933. The

31It had not always been so. Eugen Weber notes that in nineteenth-century France "Tuberculosis--which dominated the later nineteenth century as cancer does the later twentieth century--was as readily, and as dogmatically, linked to alcoholism as lung cancer is to smoking." (France, Fin de Siècle. [Cambridge: The Belknap Press of the Harvard University Press, 1986], p. 63)

32E. D. Kilbourne, "The Epidemiology of Influenza," in Kilbourne, ed., The Influenza Viruses and Influenza, p. 524. Aerosol infection occurs within the lung, not in the nasal or throat passages as with direct contact infection. Accordingly, aerosol infection is the more swift and certain--"Probably a single particle can infect through aerosol inhalation." (Ibid.) It is unclear how long influenza virus can survive in an evaporated state on dust particles or as droplet nuclei, but it seems unlikely that it would be for more than a few days--otherwise, influenza would be what Paul W. Ewald calls a "sit-and-wait" parasite, one that can survive outside its host for extended periods, and for this reason a formidable pathogen. Ewald notes that "...the smallpox virus which kills one in ten...can survive for more than a decade outside the host. The agents of tuberculosis and diphtheria can survive for months and are correspondingly severe." (The Evolution of Infectious Disease, p. 63)

33Ibid., p. 525.
Simultaneous eruption of influenza at widely scattered points around the globe, a salient feature of all modern pandemics, appears to rule out transmission solely through personal contact. Nor does the microbiology of the disease help explain its periodicity—the visitation of influenza of 1847 was of near pandemic proportions, but epidemic 'flu thereafter disappeared from Europe almost entirely until the pandemic of 1889-1892. In the twentieth century, pandemic influenza has struck in 1918, 1946, 1957 and 1968, and the 11-year cycle of the latter three pandemics has proved an enduring source of fascination for many influenza researchers. Nor can laboratory research explain variations in the mortality rate among pandemics, or locally variable mortality rates within a particular pandemic, and the connection these may have with influenza's means of travel. Such problems have prompted some silliness in addition to conscientious science.

The tendency of influenza pandemics to erupt in several places at once has found a consensus explanation in the concept of "pre-seeding," whereby influenza is carried by hosts with subclinical cases (i.e., bouts of the 'flu characterized by few or no symptoms) of the virus. There is evidence that such "... silent infections are part of the epidemiologic chain and, as they increase in proportion to rising population immunity, may facilitate virus spread because they do not immobilize the infected person." Only when the virus

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34 See Kilbourne, *Influenza*, p. 277, and Kilbourne, "The Epidemiology of Influenza," in Kilbourne, ed., *The Influenza Viruses and Influenza*, p. 498. Note, however, that this explanation is extraordinarily homocentric as it discounts, even ignores, non-human host populations—many domestic animals, as well as wildfowl (including long-distance migratory birds) can harbor the virus—a topic to which Kilbourne devotes some attention. For some obscure reason, seals are the only wild mammals known to harbor the virus of influenza A. See Beveridge, *Influenza: The Last Great Plague*, pp. 49-53, and Kilbourne, *Influenza*, pp. 228-44.

There is some evidence that migratory waterfowl, as they typically carry influenza
encounters a large enough population of non-immune hosts does the disease burst forth in an epidemic. Moreover, the advent of air travel--the Asian 'flu of 1957 had access to intercontinental flights, the Hong Kong 'flu of 1968 to jet travel--while it has marginally increased influenza's velocity, has not altered its pattern of eruption.

The mystery surrounding the periodicity of influenza, by contrast, has elicited much nonsense. R. E. Hope-Simpson has pointed to the 11-year cycle of the mid-

virus in their digestive tracts and shed the virus with their feces, may well be responsible for some, perhaps most instances of long-distance transmission. Once the virus particles are shed, "These viruses will remain viable for at least four weeks in water at a low temperature (four degrees Celsius) and for five days in water at room temperature (20 degrees C.). It is therefore likely that influenza is a waterborne infection, at least among avian species, facilitating the transmission from wild ducks to domestic animals, and perhaps even to man through untreated water." (Kaplan and Webster, "The Epidemiology of Influenza," p. 105)

F. G. Crookshank, citing the British Report of 1920 on the pandemic of 1918-1919, predicted the pre-seeding concept, arguing that "... pandemic influenza always 'casts a shadow before.'" (See his "The Theory of Influenza," in Crookshank, ed., Influenza: Essays by Several Authors, pp. 459-60.) According to Beveridge (Influenza: The Last Great Plague, p. 49), Shope agreed that "... widespread 'pre-seeding' of virus occurred without causing disease." The U. S. Army Medical Corps had to agree, concluding: "... that the rates of incidence and mortality for widely separated commands [in the AEF in France and in camps in the United States] were so nearly synchronous in their rise and fall for each wave as to impress the student with the probability that the virus of the disease had achieved a world wide distribution months before the mortality records forced recognition of its prevalence." (Office of the Surgeon-General, The Medical Department of the U. S. Army, ix, p. 86.

It is widely agreed that most influenza pandemics begin in the dense populations of Eurasia, and especially in east Asia, precisely because of the close quarters in which domestic animals and people tend to live. This permits the ready passage of influenza from animal to human hosts. Hence, the habit of designating geographical origins for influenza pandemics is an old one--the pandemic of 1889-1892 was commonly referred to in Europe as the "Russian 'flu."

There is evidence that some viral diseases can travel by air as "... during recent years it has been found that two virus diseases of animals--Newcastle disease of chickens and foot-and-mouth disease of cloven-hoofed animals--sometimes spread many kilometres from one farm to another on the wind." (Beveridge, Influenza: The Last Great Plague, p. 48) No evidence has been produced that influenza is such a virus.
twentieth century and attempted to make the connection between influenza and solar radiation. He contends that epidemics are triggered in this fashion, claiming that "The role of season is suggested as providing the stimulus that initiates reactivation of latent virus around the time of minimal solar radiation." Others have highlighted influenza's cyclical pattern of reappearance to reopen the question of influenza's relationship to the English Sweates, an infectious disease that swept through Europe in the fifteenth and 

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35See his "The role of season in the epidemiology of influenza," in the *Journal of Hygiene, Cambridge*, v. 86, no. 35 (1981), p. 44. In an Appendix ("Hypothesis of influenza A virus epidemic mechanisms"), Hope-Simpson lays out his contention in a series of propositions, arguing that, after influenza has swept through a region, the virus "... rapidly becomes latent in the tissue of the human host causing him no further disturbance, and inaccessible to discovery by the present techniques of virus isolation." Then "The latent virus residues are reactivated seasonally in their carrier-hosts by an extraneous stimulus that, being ultimately dependent on seasonal variation in solar radiation, affects all parts of the globe, the timing of its operation in a particular locality depending broadly upon the latitude." (Ibid., p. 46)

Hope-Simpson here argues backwards from the record— as historians and researchers in the historical sciences must— but cannot make a falsifiable (and therefore a verifiable) connection between the movement of influenza and the path of maximum solar radiation. F. B. Smith has noted that "... Hope-Simpson [has] pointed out that influenza outbreaks since 1932-3 were synchronic with eleven-year cycles of sunspot activity. He suggested that they could be calculated back to the 1917 outbreak. I think that they can also be calculated back to 1889[!], but that does not amount to proof." (See F. B. Smith, "The Russian Influenza in the United Kingdom, 1889-1894." *Social History of Medicine*, v. 8, no. 1 [April 1995]: p. 63n.)

Hope-Simpson's claim is purely descriptive and contains no operative elements. He could make a plausible case only were he able to pinpoint agency, to answer the question, *how* does solar radiation provide a stimulus to influenza A virus? It is for this reason, perhaps, that his article is so speculative in tone—and littered with the passive voice. Darwin knew better. In a letter to Charles Lyell, written a week after the publication of *Origin of Species*, he confessed "It has taken me so many years to disabuse my mind of the too great importance of climate—its important influence being so conspicuous, whilst that of a struggle between creature and creature is so hidden—that I am inclined to swear at the North Pole, and, as Sydney Smith said, even to speak disrespectfully of the Equator." (See Francis Darwin, ed., *The Life and Letters of Charles Darwin*. Two volumes. [New York: D. Appleton and Company, 1899], ii, p. 8. The emphasis is Darwin's.)
sixteenth centuries and thereafter disappeared.\textsuperscript{36}

In like fashion, pandemic mortality rates, particularly that of Spanish influenza, have drawn a host of explanations, and many of these have not been thought through with care. Statisticians during the 1918-1919 pandemic and in its immediate aftermath were obsessed with racial and intergenerational comparisons of mortality; the latter have proved useful in establishing the greater mortality among young adults. The knowledge that can be salvaged from the racial (and racist) comparison studies, however, remains uncertain.\textsuperscript{37}

\textsuperscript{36}For the Sweates, see Richard Gallagher, \textit{Disease that Plague Modern Man: A History of Ten Communicable Diseases}. (Dobbs Ferry, NY: Oceana Publications, Inc., 1969), pp. 43-44. Gallagher suspects that the "sweating sickness" (also known as the "Trouse gallant" and "Stump gallant") was influenza, but allows that it might well have been typhus fever. The first wave of the epidemic struck in southern England in 1485, then returned in 1507, 1518, 1529 and disappeared after the visitation of 1551. The infection jumped the Channel to the Continent in 1529.

\textsuperscript{37}These comparison studies were made, of course, because all belligerent armies were racially segregated—the U. S. Army by law and regulation, those of the Continental powers by regulation and custom, with dark-skinned colonial troops serving on the western front under white officers. Black troops in the U. S. Army who saw combat (in the 92nd Infantry Division) served under white and black officers (though none of the black officers held rank above captain). Four regiments of the 93rd Infantry Division also saw combat, but did so with French divisions under French command throughout 1918. See Arthur E. Barbeau and Florette Henri, \textit{The Unknown Soldiers: Black American Troops in World War I}. (Philadelphia: Temple University Press, 1974), especially Chs. 5, 7 and 8.

The British proved to be little more liberal in their view of black American soldiers than the Americans. In May 1918, Pershing, on orders from Washington, attempted to assign the 92nd Infantry Division to the BEF's sector of the front for training; HMG adamantly refused, the Minister of War (Lord Milner) responding that "... a good deal of administrative trouble would, I think, necessarily arise if the British Army had to undertake the training of a colored Division." (See Pershing, \textit{My Experiences in the World War}, ii, p. 46.)

The French, by contrast, "... were anxious to have colored troops assigned to their divisions, and ... four regiments [of the 93rd Division] had been lent to them ..." (\textit{Ibid.}, p. 45) The French Army, of course, was not in a position to turn down \textit{any}
Too often, however, the wartime conditions of 1918 have provided researchers in the ensuing decades with altogether too many easy explanations for the mortality of Spanish 'flu: soldiers were crowded into camps, transported at close quarters by rail over long distances, exposed to all kinds of weather, in addition to the everyday stress of army life and active duty at the front. In similar ways, civilians (as was noted in the Introduction) were subject to many of the same privations: overwork, overcrowding, a additional manpower, but even French civilians in the provinces tended to tolerate AEF soldiers regardless of color, at least to the conclusion of hostilities—the new port facilities at Bordeaux, American Bassens, were constructed between November 1917 and March 1918 by a force of 8,000 black American troops. (See Courteault, La vie économique à Bordeaux pendant la guerre, p. 29.)

French civilians, over time, were disaffected by American soldiers, not primarily because of their color, but because their high pay drove up prices (American troops "... lead a big, wild life"), because their presence encouraged vice (instances of faux ménages and prostitution both increased dramatically during the war), because Americans were so unlike the French themselves. In his monthly report submitted to the Prefect of the Gironde in March 1919, the Commissaire spécial of Bordeaux concluded that "... the public tends to modify its sentiments vis-à-vis our American allies, to whom they attribute most of the responsibility for the increase in the cost of living, some abuses of our hospitality, a general casualness and education and mores very different from our own, sometimes shockingly so." (See Archives départementales de la Gironde. IM 415: Rapport mensuel, no. 3449, 1 March 1919.)

Nevertheless, it has been argued that a visceral racism finally congealed within French national consciousness during the war, largely the result of conflicts between French colonial workers and French soldiers and civilians. See Tyler Stovall, "The Color Line behind the Lines: Racial Violence in France during the Great War," American Historical Review, v. 103, no. 3 (June 1998): pp. 737-69.

As George C. Williams and Randolph M. Nesse have pointed out, "The [evolutionary] adaptive significance of human racial differences is generally dubious. ..." (Nesse and Williams, Why We Get Sick, p. 155) This is so because the ramifications for an individual in having lighter or darker skin may be significant—the passage cited at the head of this paragraph is taken from a discussion of the variable susceptibility of people to ricketts as a result of skin color. But the actual physical difference between lighter and darker skinned individuals remains just that—skin deep. For brief but useful commentaries on the controversy over the use of racial categories in human taxonomy, see Stephen Jay Gould, Ever Since Darwin: Reflections in Natural History. (New York: W. W. Norton & Company, 1977), pp. 214-21, 231-47.
diet at best merely adequate, along with constant worry about their absent menfolk.

Some researchers have wandered farther afield in the search for answers. Robert S. Katz has posited the crucial part played in the chain of infection in the United States by young, recent immigrants from rural regions of Europe. According to Katz, these young people, as they had been born after the previous pandemic (that of 1889-1892), and as they were of rural origins and probably escaped infection with interpandemic influenza in the years before 1918, formed a large, vulnerable host population for the Spanish 'flu. In addition, once domiciled in the United States, these young people, overwhelmingly poor and crowded thick into tenements and factories, became a concentrated, irresistible target for Spanish influenza.  

These arguments, however, fail to hold up on closer examination. The lethal wave of the 1918 pandemic struck France and Europe out of season, beginning in August and burning out by December. It is true that confined populations experience heightened susceptibility to influenza A, but many of the pandemic's victims, especially soldiers, spent most of their time confined neither to barracks nor tents--there were too few of these to go around--but outdoors. Most of their transport time was spent not in crowded railway

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39These confined spaces may be of any sort--hospitals, schools and prisons have always been the usual suspects. See Kilbourne, "The Epidemiology of Influenza," in Kibourbe, ed., The Influenza Viruses and Influenza, pp. 525-26.

American troops in France, because of the frantic pace at which they were shipped overseas in the spring and summer of 1918, were billeted either in temporary barracks or in whatever out-buildings happened to be available--old mills, barns, stables and the like. The barracks were ventilated the old fashioned way, with open windows and doors, and
cars, but on foot—and the weather in northern France in the late summer and early autumn of 1918, the rains of early September notwithstanding, was not entirely unpleasant.

Katz's line of reasoning also falls to ground upon closer scrutiny. As his studies approach the problem of mortality only in the context of the United States, they have no hope of providing a more comprehensive explanation for a worldwide epidemic—why, for example, did the French relatives of those immigrants, also born since 1892 and raised in rural villages, not die in such staggering numbers as their emigrant countrymen and women? But Katz's argument fails for another reason. The population of Europe began to skyrocket before the mid-nineteenth century. As there had occurred no pandemic between 1847 and 1889, and as working and housing conditions were at least as crowded the French buildings were invariably in a state of disrepair and, consequently, hopelessly draughty. See Lt. Col. Frank W. Weed, M. C., The Medical Department of the United States Army in the World War. Volume vi: Sanitation: In the American Expeditionary Forces. (Washington: Government Printing Office, 1926), pp. 579-85, for examples of inspection reports.

Because troops were discovered closing barracks' windows at night, regulations were issued requiring nightly inspections to ensure these remained open to provide ventilation (Ibid, p. 585). It was in the early twentieth century, after all, that the sleeping porch—where one could sleep with the benefit of fresh air in all seasons—reached the zenith of its popularity.

August 1918 was bone dry. The second week of September produced enough rain (over 20 mm. more than normal for the month) to make this the sixth wettest September in Paris since 1851, but the total rainfall was only 84 mm., and the temperatures were moderate. The weather from mid-September to the end of October, the period of greatest influenza mortality, was slightly cooler than normal, but also much drier. The mean temperature in Paris declined from 14.6 degrees Celsius in September to 9.0 degrees in October, and October rainfall amounted to only 26 mm. See Service de la statistique municipale. Recueil de Statistique de la Ville de Paris et du Département de la Seine, 1919. L'épidémie de grippe à Paris, 30 juin 1918-26 avril 1919. (Paris: Imprimerie des Beaux-Arts, 1919), pp. 8, 13; and Statistique Générale de la France. Annuaire Statistique, v. 39 (1916-18), Résumé rétrospectif, pp. 9-10.
and dismal in the 1880s as those which obtained thirty years later, the fact that the
pandemic of 1889-1892 was markedly less lethal than that of 1918-1919 is a subject that
deserves far more scrutiny, via both historical and biological methods.
CHAPTER 3

THE FRENCH EXPERIENCE OF SPANISH INFLUENZA

The influenza that flared at Villers-sur-Coudun in mid-April 1918 soon appeared elsewhere—first at a French forward training base for Indochinese troops at Fère-Brianges, then in French and American bases around Brest and Bordeaux.¹ This wave of influenza almost certainly originated in the United States, where 'flu suddenly erupted among soldiers in Ft. Riley, Kansas during the first week of March.² By the last week of April, 'flu had cropped up in Chaumont—General Headquarters of the AEF—Tours, Toulon, Marseille and, the next month, in Paris. The 'flu appeared at an AEF camp hospital in


Influenza spread the more quickly from Fère-Brianges as it struck there almost 1,000 drivers attached to the Service of Supply, and these men carried the infection with them to the front and the interior. See Ibid., p. 174.

²Over 2,350 white and 128 black enlisted men were hospitalized for influenza in Camp Funston (within Ft. Riley) during March 1918. Nonetheless, the shipment of American troops to France continued to accelerate—84,000 were sent over in March, 118,000 in April. See Crosby, America's Forgotten Pandemic, pp. 18-19; and Office of the Surgeon-General, The Medical Department of the United States Army, xv, part 2, pp. 966, 996.
Langres (Haute-Marne) on 3 May, at Bourbonne-les-Bains (Haute-Marne) on 20 May, and in a base hospital at St. Nazaire on 22 May. By the end of May, over 25,000 French soldiers had fallen ill in the Armies of the North and the Northeast, and another 6,500 in the Army of the Interior.³

Save that it arrived out of season, there appeared nothing unusual in this epidemic, the last of a series during the war that had begun with the appearance of typhoid fever at Verdun in September 1914.⁴ Influenza had appeared earlier in the war, breaking out in the


Delater claims that the spring wave first appeared in the interior at Fontainebleau around 10 May. See his "La Grippe dans la Nation armée de 1918 à 1921," p. 412.

In spring 1918, almost 8,000 American enlisted men (white and black) were hospitalized in France for influenza; these admissions peaked in June with 3,438 admissions, and the spring epidemic petered out in the AEF in July. See Office of the Surgeon-General, *The Medical Department of the U. S. Army*, xv, part 2, p. 560. The difference in the French and American morbidity statistics probably results from the fact that the latter are for hospital admissions, and many American soldiers were "... determined not to go to a hospital. ... Buddies who went to hospitals were never seen again." This was the case ordinarily not because these soldiers died, but because they were assigned to different units upon their release from hospital. (Crosby, *America's Forgotten Pandemic*, p. 136)

The number stricken with influenza in the BEF in spring 1918 is more obscure as influenza was only made a reportable disease in the British Army on 5 October 1918.

⁴For an account of the spread of typhoid through the French army in autumn 1914, see Mignon, *Le service de santé pendant la guerre, 1914-1918*, i, pp. 532-97, and Dopter, *Les maladies infectieuses pendant la guerre*, pp. 45-106. Over 39,000 soldiers in the Third Army were hospitalized for typhoid in the first eighteen months of the war. In the entire French army for the period September 1914-February 1916, about 112,000 soldiers contracted typhoid and almost 17,000 died of the disease, over half of these by December.
French army in February 1915. This epidemic peaked with 1,183 cases (in the Third Army) in May, then quickly disappeared.5

1914. See Pedroncini, et al., Histoire militaire de la France, iii, p. 307; Bernard; La défense de la santé publique pendant la guerre, p. 67; and Huber, La population de la France pendant la guerre, p 432. Dopter notes that typhoid was always worse in the Third Army than in any other. At the height of the epidemic (November 1914, 11,793 new cases; December, 14,583; January 1915, 14,069), the entire French Army reported 400-450 new cases each day, and the Third Army accounted for 200-250 of these. See Dopter, Les maladies infectieuses pendant la guerre, pp. 47-48. Dopter records totals of 124,991 cases of typhoid, with 15,211 deaths. See Ibid., p. 50.

Typhoid had long been a scourge in France: "The association of typhoid with impure water was established in 1854 but it was only in 1886 when the secretary of the Academy of Sciences lost three daughters from it that the idea was accepted [in France], and in the 1890s deaths from typhoid were halved." (Theodore Zeldin, France, 1848-1945. Volume I: Ambition, Love and Politics. [Oxford: Clarendon Press, 1973], p. 28) The fear of typhoid had wide ramifications: "The widespread suspicion of water from tap, fountain, or well would encourage all who could afford it to drink safely bottled mineral water; it would justify another French tradition: the low regard in which . . . [water] is held." (Eugen Weber, France, Fin de Siècle. [Cambridge: The Belknap Press of the Harvard University Press, 1986], p. 57) Under the circumstances prevailing in autumn 1914, an epidemic of typhoid fever should almost have been expected.

Mignon was mobilized on 2 August and posted to the Direction du service de santé of the Third Army at Châlons-sur-Marne, where he was assigned the duties of chef supérieur du service de santé de l'armée ("titre un peu pompeux, mais réglementaire" [i, p. 22]). He was sent by General Sarrail to investigate the typhoid cases at Verdun in early October.

Typhoid struck other armies, as well. The BEF suffered 20,149 cases and 1,191 deaths in all theaters; and the German Army recorded 116,481 cases and almost 12,000 deaths. Yet the typhoid statistics reported during the Great War pale before those of the previous century: the Union Army recorded a typhoid case rate of 29.86/1,000 and a mortality rate of 36.92% during the Civil War, and the U. S. Army a case rate of 141.59/1,000 and a mortality rate of 10.47% during the Spanish-American War. See The Australian Army Medical Services in the War of 1914-1918. Three volumes. (Canberra: Australian War Memorial, 1940), ii, p. 540.

5See Ibid., pp. 618-19. There were reported in the Third Army in winter and spring 1915 a total of 3,462 influenza cases. In the war years preceding 1918, influenza produced in France 5,946 deaths in 1914, 5,068 in 1915, 4,997 in 1916 and 4,845 in 1917. See Bernard, La défense de la santé publique pendant la guerre, p. 147. The Annuaire statistique, v. 39 (1916-1918), p. 50, citing the Statistique sanitaire de la France for 1917, gives a figure of 4,826 influenza deaths for 1917.
In its wake, the mild influenza attack of spring 1918 (like that of winter 1915) did not provoke more than the usual questions as to its diagnosis, cause and means of transmission. Nor, in light of the emergency precipitated by the German offensives of spring 1918, did the Army or the Republic take undue notice. The French state and people responded to influenza as they had for the half-century past—the state compiled statistics, and the people medicated themselves with traditional remedies—herbal teas, quinine, mustard plasters, inhalations of oil of eucalyptus, even cupping and bloodletting.

These figures do not indicate, however, that with the exception of the pandemic years of 1918-1919, influenza deaths tended to fall in France during the war years. The totals for the years 1910-1913—5,797; 9,593; 4,835; and 6,158, respectively—produced higher averages, and so did the years 1920-1921: 10,382 and 6,814. See Jacques Vallin and France Meslé, *Les causes de décès en France de 1925 à 1978. Travaux et documents.* Cahier no. 115. (Paris: Institut national d'études démographiques, Presses Universitaires de France, 1988), pp. 42-43. Note that Vallin and Meslé maintain M. Huber's figure of 91,465 influenza deaths for 1918.

*Mignon confesses that, in the Third Army in 1915, "... some errors slipped by the classification of diseases under the rubric influenza, [but] the damage was not statistically significant." This is not altogether surprising with secondary infections such as bronchitis or pleurisy, nor even with typhoid. With the latter the "... onset is generally more or less acute. The patient always complains of headache, often of abdominal discomfort and sometimes of diarrhoea. The diarrhoea soon ceases, but the headache persists and pains in the back and limbs develop, so that by the fourth day he generally feels too weak and ill to continue with his usual occupation." These match fairly closely the ordinary symptoms of influenza, and bear some resemblance to those of malaria, as well. See Hurst, *Medical Diseases of War,* p. 263.

Hence, during the early weeks of the influenza epidemic of 1915, some doctors in the Third Army could only with difficulty distinguish 'flu from typhoid. See Mignon, *Le service de santé pendant la guerre, 1914-1918,* iv, p. 619.

*Zeldin cites an instance of a doctor in 1911 "... in the Vendée [who] reported that the doctrines of Broussais still had many fervent followers." Broussais believed "... that the cause of all diseases was inflammation, particularly in the intestines. He prescribed abundant blood-letting, leeches and severe diets. His starving patients, bled
This laissez-faire response to influenza would change dramatically in the autumn.

The first inkling that something was amiss came at the end of June, when influenza broke out among troops in Privas (Ardèche)—412 of 700 men were struck with 'flu, 271 with pleurisy, and 15 died. Soon after, influenza also appeared at Grenoble, Chambéry (Savoie) and Romans (Drôme). Then on 24 July, Dr. Jules Renault was sent to Switzerland to investigate "... une maladie 'pestilentielle' mal définie." He filed his report with the Conseil supérieur d'hygiène publique on 31 July, concluding that this new affliction was influenza, here and there characterized by pulmonary complications. The Conseil, on 12 August, recommended to the Ministry of the Interior that civilians and the grands blessés repatriated through Switzerland be examined thoroughly for infection (and their lodgings at the frontier improved), but stopped short of advising quarantine.

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white, died like flies, but he was nevertheless made a professor at the faculty of Paris (1831)." *(France, 1848-1945, i, pp. 24, 27)*

Hildreth notes that "In France, the withdrawal of 500-700 cc. [of blood] was recommended in critical cases of influenza, in the presence of severe pulmonary oedema, heart failure, and cyanosis. In the military, Milne recommended 600-800cc." *("The Influenza Epidemic of 1918-1919 in France," p. 293)*

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*See Delater, "La grippe dans la Nation Armée," p. 414.*

*Bernard, *La défense de la santé publique pendant la guerre*, p. 154.*

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*See *Ibid*. Renault took pains to discount reports that the Swiss were beset with epidemics of diphtheria, typhus, plague, or cholera, indicating the readiness of the public to believe most anything as the war began its fifth year. Excerpts from Renault's report were published in the *Revue d'Hygiène*, v. xi (1918): pp. 540-42. Renault was, in 1918-1919, the president of the "Société de médecine publique et de génie sanitaire."

This report, of course, produced no result as the German Army mounted its last concerted offensive on the western front, in Champagne, on 15 July. The Allies responded with a counter-offensive on the 18th and, under Foch's direction, never surrendered the initiative thereafter.
On 30 July influenza appeared in the French armies of the line, in the Eighth Army among troops of the class of 1919 training in Lorraine. By early August soldiers of the Seventh Army at Brienne-le Château (Aube) had contracted influenza, and by 10 August 'flu was reported in the Second, Fifth and Sixth Armies, and in the Army of the Interior.\(^{11}\)

Whether these isolated instances of 'flu represented a recrudescence of the spring outbreak, or portended something new, no one could be sure, but there was an alarming increase in secondary infections. By the end of the third week of August, however, there could be no doubt that influenza, now \textit{la grippe maligne}, with grievous pulmonary complications, was loose. French armies in France reported a total of almost 12,000 cases of 'flu in August. This in itself was not alarming--there had been 11,000 cases in July.

What was worrisome was the leap in the number of deaths. Only 213 French soldiers had died of influenza and its complications in France in July; 879 died of these causes in August.\(^{12}\)

The report also failed to prompt any action in the face of the usual bureaucratic inertia. As Mignon noted of an instance earlier in the war, "So many letters written, so much paper filed" ("Autant de lettres écrites, autant de papiers classés"). See \textit{Le service de santé pendant la guerre, 1914-1918}, i, p. 234.

\(^{11}\)Delater, "La grippe dans la Nation Armée," p. 414; and Dopter, \textit{Les maladies infectieuses pendant la guerre: étude épidémiologique}, pp. 177-78.

\(^{12}\)See Bernard, \textit{La défense de la santé publique pendant la guerre}, pp. 151-52. The confusion between the first and second waves of Spanish influenza in France serve to highlight the latter's importance as a \textit{foyer d'épidémie}, an epicenter of infection. The inability to disentangle the first and second waves indicates that the second wave of Spanish 'flu did not arrive in France from elsewhere, but arose within France.

This point is of little consequence for the French export of influenza in 1918--where the autumn wave originated matters naught for the hypothesis of this study--but has important ramifications for the identification of the species in which influenza recombined in summer 1918 to produce the lethal, autumn wave.
The U. S. Army Medical Corps in France also noted an August increase in influenza cases—up to more than 8,000 from 5,097 cases in July, and this increase was especially troubling as the earliest cases of influenza complicated by secondary infections appeared at the two busiest American base ports in France—Brest and Bordeaux.\(^{13}\) Medical Corps doctors, however, were puzzled by the fact that "... both in this country and in Europe the rates for respiratory disease began to rise at least as early as the month of August and that the rise was practically simultaneous in the two forces, separated by thousands of miles of water." They later confessed bafflement: "That an epidemic wave once developed is spread by contact of cases, is of course, incontrovertible. But that the widespread, practically simultaneous, increase in the rates ... of the pandemic could have been accounted for by transmission from case to case of a common source seems incredible."\(^{14}\)

These theoretical epidemiological concerns of late August, however, were quickly submerged by the enormous tide of influenza that arrived in September. Morbidity rose in both the Army of the Interior and the armies of the line to over 25,000 cases each; almost 5,000 French soldiers died in France of influenza in September, while the AEF reported a

\(^{13}\)See Office of the Surgeon-General, *The Medical Department of the U. S. Army*, vi, p. 1106.

\(^{14}\)See Office of the Surgeon-General, *The Medical Department of the U. S. Army*, ix, p. 84. Resolving this bafflement is, of course, the object of this study.
further 37,935 influenza cases in France. But the ‘flu was as yet primarily a soldier’s affliction in France—of the 3,918 Parisians who died in September 1918, only 232 succumbed to influenza.

This changed utterly in October. In the five week period from 29 September to 2 November, 11,229 people died in Paris, of whom 4,701 died of influenza. As altogether 3,549 people died of pneumonia in the Department of the Seine in 1918, and another 528 of acute bronchitis, it is likely that a substantial number of these were collateral victims of pneumonia.

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15See Bernard, *La défense de la santé publique pendant la guerre*, p. 152; Office of the Surgeon-General, *The Medical Department of the U. S. Army*, vi, pp. 1106-07; Crosby, *America’s Forgotten Pandemic*, p. 159. The Medical Department concluded that influenza "...may be said to have raged in the American Expeditionary Forces, reaching its height in the third week of September." (Office of the Surgeon-General, *The Medical Department of the U. S. Army*, vi, p. 1109)

As the British Army did not begin to collect influenza statistics for British soldiers in France until the first week of October 1918, the BEF influenza figures are, perhaps, unrecoverable before that date. For British soldiers in the United Kingdom, however, there were 2,306 hospital admissions in April, 4,737 in May, then 31,138 in June and another 25,480 in July. Among British soldiers, both in Great Britain and in France, influenza all but disappeared during August and September. See Major-General Sir W. G. Macpherson, et al., eds., *Medical Services: Diseases of the War*. (London: H. M. S. O., 1922), pp. 174-75.

The U. S. Army Medical Corps determined during the early stages of the pandemic that deaths would be assigned to influenza only in the complete absence of pneumonic complications. Hence, while the French Army reported almost 5,000 deaths due to influenza in September, the AEF recorded only 56 such deaths that month, but did record 2,444 pneumonia deaths. The Canadian forces did likewise, reporting during 1918 45,960 cases of influenza, but only 776 deaths. When pneumonia and influenza were counted together, the death rate approached 80%. See Sir Andrew Macphail, *Official History of the Canadian Forces in the Great War, 1914-1919. The Medical Services*. (Ottawa: F. A. Acland, 1925), p. 271.

16See Service de la statistique municipale, *Épidémie de grippe à Paris, 30 juin 1918-26 avril 1919*, p. 5. These figures include the Paris suburbs.
The pandemic also crested in the Allied armies in October. The Army of the Interior recorded 41,422 cases of influenza and 3,132 deaths, while the armies of the line reported 75,719 cases and 5,917 deaths. The AEF reported 38,655 cases of 'flu in October, with 269 deaths (but also 7,008 cases of pneumonia, of which 4,823 resulted in death), and the BEF figures add 39,216 to the morbidity totals, and 1,895 to the list of dead.

And it was in October that the civilian dead began to accumulate in the provinces, as well. The highest death tolls in France, calculated by absolute numbers, were recorded in the Paris region (the Departments of the Seine, Seine-Inférieur and Seine-et-Oise), Hérault and the Bouches-du-Rhône on the Mediterranean coast, the Departments of the **See p. 5 and 7; and Annuaire statistique, v. 39 (1916-1918), p. 52. Influenza deaths in the Department of the Seine for 1918 totaled 10,140, and another 2,268 died of 'flu in 1919. The average annual total for influenza deaths in Paris for the period 1908-1917 was 118.

The figures for Paris are not entirely congruent as different organizations tabulated statistics for slightly different entities. The Annuaire statistique recorded mortality for the Department of the Seine; the Service de la statistique municipale did so in different categories for Paris and its suburbs; and the French Army maintained records for the Gouvernement-militaire de Paris (roughly speaking, Paris and its immediate suburbs).

17See Ibid., pp. 5 and 7; and Annuaire statistique, v. 39 (1916-1918), p. 52. Influenza deaths in the Department of the Seine for 1918 totaled 10,140, and another 2,268 died of 'flu in 1919. The average annual total for influenza deaths in Paris for the period 1908-1917 was 118.

18See Bernard, La défense de la santé publique pendant la guerre, p. 152.

19See the Office of the Surgeon-General, The Medical Department of the U. S. Army, vi, p. 1106; Crosby, America's Forgotten Pandemic, p. 159; and Macpherson, et al., Medical Services. Diseases of the War, p. 175. The British totals omit the first four days of October, but include the first week of November.

The Belgian Army—miniscule by comparison with those of the other Allies—also reported escalating influenza losses. Following 18 cases of influenzal pneumonia recorded in June, there appeared 37 in July, 113 in August, 289 in September, and another 692 up to 24 October. See J. Rieux, "Revue des journaux," in Revue d'hygiène, v. xli (1919): p. 702.
Loire and the Rhône, the Gironde on the Atlantic coast, and three departments in Brittany (Finistère, Morbihan and Ille-et-Vilaine). The greatest mortality tolls as a proportion of the population were recorded in the Hautes-Alpes (7.6/1,000), Savoie (6.9/1,000), Ardèche (5.5/1,000) and Ariège (5.2/1,000).

The lethal, autumn wave of influenza reached the zenith of its intensity in the AEF in the week ending 22 September, among French civilians generally in October (and in Paris in the week ending 26 October during which 1,473 died of 'flu), and in the BEF in the week ending 9 November. By late December, the hostilities halted by armistice and the Peace Conference about to open in Paris, the virus had seemingly burned itself out in Europe and North America. The Spanish 'flu would reappear in France in February 1919--these trailing waves of influenza are characteristic of all modern pandemics--but this third wave, though more deadly than that the previous spring, would claim far fewer lives than the autumn wave.

By May 1919, the Spanish 'flu was gone; it seemed then (and seems now) to have evanesced. In addition to the more than 100,000 French civilian victims, influenza and its

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20 See the Annuaire statistique, v. 39 (1916-1918), pp. 51-52. This ranking is based on annual totals for influenza for 1918 in each department, but most of the deaths occurred during the autumn wave of the pandemic, principally between late September and mid-November.

21 Calculated from Ibid.

22 See Office of the Surgeon-General, The Medical Department of the U. S. Army, vi, p. 1107; Service de la statistique municipale, Épidémie de grippe à Paris, 30 juin 1918-26 avril 1919, p. 5.

23 See Huber, La population de la France pendant la guerre, p. 283.
secondary infections killed, in France, more than 25,500 French soldiers, almost 10,000 American soldiers, and at least another 3,600 in the British Expeditionary Force. These casualty figures pale beside those of the Battle of the Frontiers or Verdun or the Somme; influenza in 1918 inflicted losses on Allied armies similar to those of the small-scale actions of 1915. But there was a difference with the Spanish ‘flu. Combat carried off young and middle aged soldiers. Influenza proved less discriminating—it attacked women as well, and no cohort was at greater risk than pregnant women. This should have been of particular concern in a state which, for at least a generation past, had been all but frantic over a falling birth rate, a demographic Achilles' heel now compounded by enormous battlefield casualties. This dilemma begs the question: how well equipped were the French Army and the expeditionary forces of its allies to combat the ‘flu, and what measures did they take?

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The French Army that went to war in August 1914 was, at its foundation, the creation of the reforms that followed the humiliating defeat of 1870-71. The Prussians and their German allies required a mere six weeks to force the capitulation of the emperor


25This was noticed by contemporaries. Dr. Camescasse noted in the Revue d'hygiène the following year that "[Influenza] killed, it killed by preference young women, striking down the most active. . . ." See "Le taudis rural et l'épidémie de grippe de 1918." Revue d'hygiène, v. xli (1919): p. 92. See also Tomkins, "The Failure of Expertise: Public Health Policy in Britain during the 1918-19 Influenza Epidemic," p. 446.
at Sedan, but this was time enough to let loose three epidemics--dysentery, typhoid fever and smallpox. Dysentery and typhoid were largely confined to soldiers, and especially prisoners of war. German armies in France suffered over 74,000 cases of typhoid and almost 9,000 deaths, and of the nearly 40,000 who contracted dysentery, 2,405 died.²⁶

Smallpox was already present in France before the war--3,900 had died in 1868 and another 4,164 in 1869 in Paris alone, and there were outbreaks in the latter year in Brittany, Flanders and along the Spanish border. The war, however, extended the epidemic throughout the country in 1870-71, and smallpox killed at least 30,000 people (and possibly as many as 60,000) in France, civilians and soldiers alike.²⁷

²⁶See Friedrich Prinzing, Epidemics Resulting from Wars. Edited by Harald Westergaard. (Oxford: Clarendon Press, 1916), pp. 190-95. Prinzing estimates the German armies of the line to have included over 33,000 officers and 1,113,354 men of the ranks, of whom approximately 800,000 were in France at any given time. (Ibid., p. 189)

²⁷See Ibid., pp. 199-201. Prinzing provides an extended discussion of smallpox in Epidemics Resulting from Wars, pp. 197-285. Léon Bernard lists French losses to smallpox as 23,470 deaths from among 125,000 cases. See his La défense de la santé publique pendant la guerre, p. 144.

Smallpox also proved to be the first installment of la revanche--French prisoners of war and returning German soldiers carried the infection to Germany, and by the close of 1872 almost 170,000 Germans had succumbed to smallpox. Merely as a result of being in the way, Belgium and The Netherlands also suffered, recording 30,000 and 20,000 deaths, respectively. See Prinzing, Epidemics Resulting from Wars, pp. 274, 284.

It was the laxity with which the French enforced compulsory vaccination for army recruits that made this epidemic possible. The edict of Napoleon in 1806 was only occasionally enforced after the Restoration, and his nephew's renewal of this order in 1857 "... does not seem to have been everywhere carried out with the necessary strictness, and complaints regarding the partial success of vaccination were frequently made by military physicians." (Ibid., p. 200)
This object lesson in wartime hygiene notwithstanding, the methodical and comprehensive planning devoted to the restoration of the Army's offensive capabilities, and to frontier defense, were not applied to military hygiene as it was embodied in the Service de santé militaire. On the eve of the Great War, the Service included only 1,300 doctors, 185 pharmacists and 350 administrative officers. These numbers must have been insufficient for the prewar force of 817,000 men. As 2,689,000 men were mobilized by 15 August 1914, one suspects that the Service was overwhelmed by the sheer size of its own army, even before the rush of casualties that arrived in late August. Doctor Navarre, a député (Seine) and a vice-president of the Commission de l'hygiène publique, recalled in 1918 "... how feebly the Service de santé militaire performed its task at the opening of hostilities. The war revealed it to be in full disarray: equipment was lacking and the personnel were not prepared to address the requirements of the service that they would have to fulfill."28

The one positive result of this calamity in Germany was legislation in 1874 mandating compulsory infant vaccination. See Ibid., pp. 284-85. France only instituted compulsory infant vaccination with the law of 15 February 1902. And this time the law was enforced--France recorded only 561 smallpox deaths during the Great War. (See Bernard, La défense de la santé publique pendant la guerre, pp. 135, 143; and the unsigned "La santé publique pendant la guerre," in Annales d'hygiène publique et de médecine légale, v. xxiii, no. 4 (January 1915): p. 305)

28Navarre, "Création d'un ministère de la santé publique." Revue d'hygiène, v. xl (1918): p. 642. In September 1914 there were just 25 sections sanitaires attached to French armies; by the time of the Armistice, there would be 206. (See Joseph-Henri Toubert, Le service de santé militaire au Grand Quartier Général français. [Paris: Charles Lavauzelle & Cie., 1934], p. 106.)

As the Service had to fill out its ranks of unit doctors from among the mobilisés during mobilization, one can imagine the resulting confusion. In August 1914 there were approximately 22,000 physicians practicing in France, and 18,000 of these were mobilized in the first month of the war. By 11 November 1918, the French Army included 21,181
In part this lack of preparation was the result of the novelty of the bacteriological revolution—the first wave of anti-toxins (such as that for rabies) were not available in quantity until the 1890s. It was also the result, in part, of the lingering distrust between an Army high command with a prominent Catholic and clericalist component and the aggressively secular and anti-clerical politicians and fonctionnaires of the positivist Republic, and the desire of the latter to restrict Army expenditures (and therefore avoid the need for tax increases).

Most of all, however, the scant attention paid to the medical corps, the creation of a Service de santé militaire that was at best a skeleton organization entirely beholden to the authority of line commanders, was the logical outcome of the Army's war plans and tactical doctrine. The anticipated conflict with Germany was expected to be sharp and swiftly decided; hence, the general staff's emphasis upon the offensive à outrance and Colonel de Grandmaison's assurance that "in the offensive, imprudence is the best

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 doctors, 3,828 pharmacists, 5,238 administrative officers, 120,352 medics and another 10,000 male nurses serving in hospitals. (See Ibid., p. 127.)

The law of 10 July 1889 restored to the Service its own chain of command, and internal control over medics, the ambulance service and hospital supply, but the ultimate authority over the Service when in the line lay with the line commander. See Pedroncini, et al., Histoire militaire de la France, iii, p. 306; Huber, La population de la France pendant la guerre, p. 104.

Navarre noted (p. 632) another public health dilemma in France: there were two Services: the Service de santé militaire under the jurisdiction of the Ministry of War, and the Service de santé under the authority of the Ministry of the Interior; altogether, five ministries had authority to make decisions affecting the conduct of the health services. This resulted, of course, in much bureaucratic infighting which eventually wended its way to the top: "The incoherence and anarchy are so flagrant in the organization and the functioning of the services concerned with public health that, in order to alleviate these drawbacks, the Minister of the Interior was forced to appeal to the authority of the Prime Minister [that is, Clemenceau] in order to rectify a disturbing situation."
safeguard. If we push the offensive spirit even to excess it won't perhaps be enough."

It is not surprising, therefore, that a French Army consecrated to, even dependent upon, the ideal of the *furia francese*, and determined to strike at the enemy upon the completion of mobilization, made only the most makeshift plans to evacuate the wounded—and even fewer provisions for the sick—and only did so, one suspects, so that casualties would not impede the progress of French units.

The evacuation plans of the *Service* were, on paper, disarmingly simple. Each battalion established a first aid station (*poste de secours*) to which the wounded would walk or be carried by stretcher. The duties of the *médecins* at the *postes de secours* (these were invariably the youngest, least experienced doctors) were straightforward: treat shock victims, apply tourniquets to stem hemorrhaging, bandage wounds, stabilize fractures and evacuate the seriously wounded to the rear as soon as possible.

Several *postes de secours* fed into a *poste évacuateur*, to which the wounded were transported, by stretcher if necessary, by *brouette porte-brancard* (a two-wheeled cart) if possible. Here fresh bandages would be applied, more complete diagnoses made and, as the *postes évacuateurs* were located along roads or tracks, the wounded would thereafter

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29 Quoted in Brogan, *France Under the Republic*, p. 469. As many have pointed out, this doctrine "... was self-consciously rooted in the French Revolutionary tradition, updated to respond to the needs of dispersal and movement on the modern battlefield." (Herrmann, *The Arming of Europe and the Making of the First World War*, p. 81)

30 See Mignon, *Le service de santé pendant la guerre, 1914-1918*, i, p. 332. The young doctor at a *poste de secours* "... n'était pas encore riche de savoir technique, mais elle avait le sentiment du devoir professionnel et surtout la foi qui remplace tout, la foi dans son rôle, la foi dans sa force, la foi dans son propre destin." (*Ibid.*, p. 327) Consolation enough for the doctor—less, perhaps, for the dirty, exhausted and wounded soldier.
be transported to evacuation hospitals by ambulance.\textsuperscript{31} At the evacuation hospital, triage would be performed: those with serious but operable injuries (and who could thereby be restored to fitness for service) received first attention; these casualties could then be sent to base hospitals in the rear for more surgery or convalescence. Those with less serious wounds came next, untransportable cases received least consideration, and hopeless cases were to be made as comfortable as possible.

These plans, of course, produced the desired results only on paper; in reality, the system broke down in almost every conceivable way. Mignon records that he repeatedly inveighed against staff neglect of the \textit{Service}, and especially protested operations secrecy--even Mignon, the chief medical officer of the Third Army, despite his repeated requests, received no advance notice of offensive operations.\textsuperscript{32} Hence, the \textit{Service} existed in a shadow state, perpetually unprepared, tardy in its ministrations to the wounded and the sick, forever receiving the lowest priority in procuring men, animals and vehicles.

\textsuperscript{31}Ibid., pp. 333-34. Mignon claims (p. 336) an average speed of 25 kmh for these ambulance trips to the rear--this seems a stretch under even the best of circumstances.

\textsuperscript{32}See \textit{Ibid.}, pp. 25, 32 and 104. Mignon leaves the unmistakeable impression that French army doctors were like children, only more so: they were neither to be heard, nor seen.

The Americans profited from the French example: "... a number of officers of high rank were convinced that the Medical Department should not be advised in advance of impending combat activities," but "As events developed and American troops began actual participation in the war it was soon apparent that no military operations could be planned or undertaken without consultation and fullest cooperation with the medical representative of [the] section... The wisdom of so doing has been amply demonstrated; it has been equally as well demonstrated that without this harmonious cooperation the Medical Department would have been doomed to failure." See Annual Reports, War Department, \textit{Report of the Surgeon General, U. S. Army, 1919}. Two volumes. (Washington: Government Printing Office, 1919), ii, p. 1445.
Administrative neglect and lack of foresight manifested themselves in a variety of ways. Mignon records one of the earliest actions of the war in France—two battalions of French troops were surprised by a German advance column on 10 August 1914 at Mangiennes, near Verdun. French casualties—71 killed, 490 wounded, 172 missing—were compounded because many of the killed and wounded could not be identified. At the outset of the war French soldiers carried two pieces of identification, a *livret matricule* in the tunic pocket, and a *plaque d'identité* in the knapsack. Mignon discovered at Mangiennes that the second was too easily lost, abandoned in a panic or blown away by shellfire, and, in their hurried confusion, medics or surgeons routinely disposed of the first with the soldier's clothing.  

The stabilization of the western front by November 1914 permitted the establishment of more or less permanent evacuation and base hospitals so long as the front was quiet, but created manifold sanitary problems characteristic of trench warfare—the first of these was the spread of typhoid. As Mignon admits, with understatement, hygiene in French camps "... was not always practiced with sufficient care." There was, however, a rationale behind this--French officers were loathe to take troops down from

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33See Mignon, *Le service de santé pendant la guerre, 1914-1918*, i, pp. 51-55. Despite this, dog tags would not be routinely issued until the Second World War. American soldiers prior to embarkation for Europe were issued tags to be worn about the neck, but many of these tags were blank, and some units never received their tags at all. See Crosby, *America's Forgotten Pandemic*, p. 129.

34The Army began to receive portable laboratories from the Institut Pasteur in Paris in November—the first was installed at the typhoid isolation hospital established at Bar-le-Duc. See *Ibid.*, p. 279.

35See *Le service de santé pendant la guerre, 1914-1918*, i, p. 233.
the front line only to exhaust them with fatigue duty. All too often French cantonments were established in abandoned villages; Mignon notes one of these by way of example:

"We arrived in the partially destroyed village of Julvécourt, and we found the streets and buildings in the state in which they had been abandoned by the inhabitants. The streets were full of filth, the tumbledown barns and the paths that led to the latrines were as nasty as the latrines themselves. The officers were content to order straw spread about, or to have the buildings boarded up. And this was their only effort to convert the village into a regimental camp."  

When a sector of the front was active, however, the Service routinely fell to pieces. The French system of evacuation was designed to accumulate as many wounded and sick as possible at predetermined collection points so that they could be sent to the rear in large lots by motorized transport. This concentration of the blessés and malades created repeated bottlenecks even under the most favorable conditions and, worse, made it impossible to isolate the sick from the wounded (or from anyone else). Thus the above mentioned evacuation hospital at Villers-sur-Coudun, once reserved for the sick, was required to accept the walking wounded during the emergency precipitated by the March offensive. These men thereafter became ideal vectors for any diseases they may have

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36Ibid. Charles Dopter is even more explicit in his description of the failings of French hygiene in rear areas. See his Les maladies infectieuses pendant la guerre: étude épidémiologique, pp. 27-31.

37This lack of coordination between the front and rear echelons of the Service de santé, and between civilian and military personnel in the health services, was the subject of a long article by Joseph Reinach in 1915. See his "Le Service de santé militaire: Améliorations et perfectionnements à apporter sur le territoire national et aux armées." Annales d'hygiène publique et de médecine légale. v. xxiii, no. 4 (1915), especially pp. 211-12.
encountered as they moved to the rear to convalesce or returned to their units.

Moreover, as the Service was always short of road vehicles and rolling stock, conditions for the wounded were rarely favorable. Early in the war all manner of vehicles were impressed to convey the wounded to the rear—Mignon recalls instances when wounded were bundled into freshly unloaded butcher's wagons for the trip to hospital.\(^{38}\) Worse still were the evacuation trains—"le spectacle le plus douloureux des premiers mois de la guerre"—in which the wounded were transported in cattle cars or open wagons, scattered about on straw or sawdust, frequently stacked upon each other: "The backs of men were rested on the wooden floors of the car so that the body of one served as the pillow of another."\(^{39}\) In this fashion men could be left for days, exposed to the weather, in convoys that routinely spent three to four hours sidetracked at crowded regulating stations, and which averaged no more than 15 kmh when they did move.\(^{40}\) Under these circumstances, the transport of the wounded to a triage station became an integral part of the triage process.

As with so much else in the French experience of the war, conditions reached their nadir at Verdun in 1916. Frequently there were "... badly wounded who had already been waiting for treatment for several days. In tears they beseeched to be evacuated; their one terror to be labelled 'untransportable'. These, not merely the hopelessly wounded, but those whose wounds were just too complicated for the frantic surgeons to waste time

\(^{38}\) See Ibid., p. 212.

\(^{39}\) Ibid., pp. 212-13.

\(^{40}\) Ibid., p. 213.
probing, or who looked as if they would be little use to the army again, were laid outside in the bitter cold. It was not long before German shells landed among this helpless pile, but at least this reduced the doctors' work. Inside, the surgeons, surrounded by dustbins filled with lopped-off limbs, did the best they could to patch up the ghastly wounds caused by the huge shell splinters. Little wonder that Leonard Smith, in his study of the French Fifth Infantry Division, has identified the "... blessés gueris ... as a major destabilizing factor during the course of the 1917 mutinies."

Yet even in the final two years of the war, with substantial reinforcement and material aid provided by the British and American expeditionary forces, hygiene in the Allied zone of the armies improved but little. It was not, after all, just French hygiene that was open to question. As British trenches were "... wet, cold, smelly, and thoroughly squalid," they differed little from those of the French. German trenches on the western front, by contrast, were "... efficient, clean, pedantic, and permanent."

This development was the result of both chance circumstance and ineluctable forces inherent within the dynamic of the war. From the heights of the Meuse north of Verdun to Vimy Ridge, German units held the high ground in northeastern France. This was an important consideration as in the temperate northern latitudes there could hardly

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42See his Between Mutiny and Obedience: The Case of the French Fifth Infantry Division During World War I, p. 76. And these men would be a more destabilizing force as there were so many of them after the defense of Verdun. Approximately 1.4 million French soldiers were wounded at least twice during the war. See Ibid., p. 126n.

43See Fussell, The Great War and Modern Memory, pp. 43, 45.
have been a damper place—nor one with a higher water table—to conduct trench warfare.

More important, German armies were in France. The infrastructure of the German war effort on the western front was more elaborate and more permanent than that of the Allies precisely because so long as German units held defensive fortifications on French soil, Germany could not lose the war. For the Allies to dig and build on the western front with equal sophistication should have been to concede, by default, the permanence of the German fortress in France. To have made such a concession, even by implication, was for the French militarily unacceptable and politically anathema. Hence, Allied emplacements on the western front retained from late autumn 1914 to mid-summer 1918 the air of ad hoc, jury-rigged improvisations. Allied army sanitation suffered thereby, and suffered the more after the German withdrawal to the Hindenburg Line in March 1917 when Allied soldiers moved forward to occupy ground devastated both by years of shellfire and a few weeks of methodical destruction.

The British and American expeditionary forces were helpless to alter these arrangements. French armies throughout the war never held less than two-thirds of the line, and often three-quarters of its length. The British and Americans, therefore, had to adopt the French system of evacuations, not just for the sake of standard procedure, but to limit the already considerable differences in terminology and language. This was particularly true of the American Expeditionary Force. The BEF occupied the northern sector of the Allied front, possessed short lines of communications to the coast and enjoyed almost exclusive use of ports such as Calais and Boulogne. The British could

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*ibid.*, pp. 43-45.

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thus draw from vast reserves of men, animals and stores of supplies from depots in
southern England, and evacuate their wounded and sick in comparative isolation from the
French.45

For the Americans, even this limited isolation from the French war effort was
impossible. To avoid the railway congestion around and north of Paris, it was agreed in
spring 1917 that the AEF would, when ready, assume a place in the Allied line south of
Verdun, permitting the AEF's lines of communications to bypass Paris to the south over
railheads comparatively little used by British or French military traffic [See Map 3.1, p.
182]. This also reflected political necessity. In the event of calamity, the BEF would
retreat to cover the Channel ports, the French to cover Paris, leaving the Lorraine front as
the only logical place for the AEF. Even this plan, however, proved clumsy in operation.

The principal American ports of disembarkation for transports from the United States—

45Never in complete isolation, of course. The Belgian Army held the northernmost
sector of the Allied line, and French divisions were routinely sent north (as were BEF units
to the south), either to rest in quiet sectors of the line or to shore up British positions.

Still, Calais seemed to have wandered back in time: "By agreement with the
French government, the British requisitioned buildings, set up tented camps, built barracks
for the troops and vast warehouses for their supplies. The Place d'Armes displayed
dIRECTIONAL signs in English, and the traffic was directed by British military police in
uniform. There was a big Church Army club, and a camp for First Aid Nursing
Yeomanry, with a balcony where the nurses could sit in basket chairs. In August 1917
there were over 56,000 British officers and men in Calais, plus another 1,725 in military
hospitals; and at different times there were some 2,000 nurses, FANYs and members of
the Women's Auxillary Army Corps." (Bell, France and Britain, 1900-1940: Entente and
Estrangement, p. 98)

The disorientation flowed in the other direction as well. Of the over 100,000
Belgian refugees evacuated to Great Britain, A. J. P. Taylor notes "... Belgian workers
did not fit into English factories. In the end they were given a munitions town of their
own in Northumberland, where Belgian street names, Belgian police, and even, strange to
relate, Belgian beer gave them the illusion of being at home." (The First World War: An
Illustrated History, p. 59)
Brest, St. Nazaire and Nantes, La Rochelle and La Pallice, and Bordeaux—only connected with the Lorraine front along railways and through cities—Tours, Blois, Châteauroux, Bourges, Nevers and Dijon—already crowded with French military installations, factories and refugee camps. And as, until the summer of 1918, most American units that saw combat fought with French divisions under French command, the services employed by the two armies to evacuate the wounded and sick became inextricably intertwined.

The one measure the Allies could have taken to interrupt the spread of influenza from its epicenter in France—the temporary suspension of troop transports, especially from the United States—was considered and rejected. The U. S. Army Chief of Staff argued "that the lives lost to influenza must be balanced against those which could be saved if the war could be brought to a speedy end," and President Wilson agreed. So American troops continued to arrive; over 400,000 did so in August 1918, and another 225,000 in September.

The Allies, therefore, had no choice but to endure the pandemic—implementing stop-gap measures as the opportunity arose—as they persevered in their autumn

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46 See Peschaud, *Politique et fonctionnement des transports par chemin de fer pendant la guerre*, p. 87-88. The U. S. Army finally began to realize results in its transport efforts only in the autumn of 1918—in October the Americans unloaded, day and night, an average of seven men, two horses and seven tons of cargo at French ports per minute. See *Ibid.*, p. 87.


offensives. They did not go about this blindly. The French government and general staff had access to data and intelligence from a number of sources, civilian as well as military—statistics tabulated by the Services de santé, surveys compiled by the censors of soldiers' correspondence, the monthly bulletins confidentiels generated by each military region and submitted by the commandant to the 2e Bureau ("Correspondance générale") of the Ministry of War, the rapports hebdomadaires submitted to prefects by their subordinates within each department, and the rapports mensuels submitted by prefects to the Ministry of the Interior.50

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50One must remember that the Allied command pursued the autumn offensives not to conclude the war—with one prominent exception they thought this goal out of reach in 1918—but to establish Allied forces on the high ground on the western front in preparation for what they were confident would be the decisive offensive scheduled for late winter or early spring 1919. Their confidence was bolstered by the American determination to deliver to France by June 1919 an army of 4.5 million men—by September 1918, the AEF numbered 1,690,256 effectives. (See Office of the Surgeon-General. The Medical Department of the U. S. Army, xv, part two, p. 17)

The sole exception, however, was the most important one—the ever confident Ferdinand Foch. Foch, "neither stoical nor resigned," was determined to end the war as soon as possible, and not likely to be deterred by mere sickness. The toll of Spanish influenza on the French Army rose dramatically in the autumn. Convalescent leaves of one month or less totalled 28,168 in September, reached 40,461 in October, then peaked at 45,862 in November—this at a crucial moment when French (and British) divisions had been reduced to only 8,000-10,000 men each. See Chateau de Vincennes. Service historique de l'armée de terre. 7N546: Opérations des Commissions de congés de convalescence.

50Letters to and from soldiers were routinely read and censored during the war. The resulting reports (dated the 15th of each month in 1918) on the morale of soldiers and civilians were collected by the Contrôle postal in the 2e Bureau and distributed within the general staff under the title "L'État de l'opinion en France d'après le contrôle de la correspondance."

The bulletins confidentiels résumant la situation morale à l'intérieur (also dated the 15th of each month in 1918) were produced by the staff of the military commandant of each military region and sent to the general staff. In 1914, there were twenty-one such regions in France and North Africa (the 19th region was headquartered in Algiers—on the
By mid-September the general staff had been informed that, if the Spanish 'flu had diminished in intensity in Switzerland, the infection was gaining strength in the Rhône valley and on the Mediterranean coast, and that in Germany "... Spanish influenza claimed many victims weakened by a precarious diet." In early October Russian troops at Villedomer, stricken with influenza, had to be hustled into quarantine outside Tours; Spanish 'flu was loose in the ports of Morbihan and Finistère, among the recruitment class of 1920 and naval recruits, and in the garrison at Brest; Rouen, its population inflated by declaration of a state of siege, both Paris and Lyon fell at once under the jurisdiction of a gouvernement-militaire), each responsible for an army corps (in 1914 each of these comprised two divisions of infantry and one of cavalry, along with auxiliary services). After the retreat of August 1914, the 1st (Lille), 2nd (Amiens) and 6th (Châlons-sur-Marne) were suppressed as they had either been overrun or lay within the zone of the armies.

The commandants of the remaining military regions were given broad powers by the law of 5 August 1914, and the latitude of their authority was widened by a decree of 3 September which placed all of metropolitan France under a "state of war." (See Pierre Renouvin, The Forms of War Government in France. [New Haven: Yale University Press, 1927], p. 29) This wide ranging authority appears to have occasioned some bitterness in the préfectoral corps: "After 1914, the French military had rapidly taken power for themselves: 'The prefects are finished, the deputies don't matter, the generals can feed on civilian flesh'--a real Revanche, for which part of the professional army had been waiting since Boulanger and Dreyfus. ... The military appointed judges and sub-prefects; quite early on, a circular from the High Command forbade prefects to telephone without permission, even their own ministry." (Ferro, The Great War, 1914-1918, p. 147)

In September 1915, prefects in the zone of the interior had restored to them "... all their normal police functions," (Renouvin, The Forms of War Government in France, p. 32.). This arrangement lasted until the swelling American presence in western France spurred the government to make one more change. By the law of 5 January 1918, the commandants of the regions from Brest to Bordeaux had their extraordinary powers restored "... with a view to the maintenance of order and the repression of spying." (Ibid., pp. 32-33)

51 Chateau de Vincennes. Service historique de l'armée de terre. 7N955: L'État de l'opinion en France d'après le contrôle de la correspondance de 15 août au 15 septembre 1918. These victims included French prisoners of war.
the BEF presence in the town, was similarly stricken, and the spread of influenza in the south prompted French authorities to close the Spanish frontier, much to the anger of migrant Spanish workers. 52

As influenza spread over much of France in the last three weeks of October, the bulletin confidentiels for November swell with news of the pandemic. In Paris, "The public demands energetic measures to combat the epidemic [which boiled down to placing 'plus de médecine à la disposition de la population']." A manpower shortage exacerbated by absences due to influenza heightened a transport crisis at Orléans and "... alarms the populace for whom resupply becomes more and more difficult." In the 7th region (Besançon), 'flu continued to spread despite the release of Service doctors to aid the civilian population. And if Spanish influenza had begun to abate by early November in the lower Loire valley and Brittany, it did so only after its appearance had sparked rumors of the imminent arrival of cholera and other dread epidemics. 53

52Chateau de Vincennes. Service historique de l'armée de terre. 5N268: Bulletin confidentiel, 15 October 1918.
Charles Dopter, as early as 1921, made the connection between the rapid spread of respiratory disease and training camps: "It is noteworthy, moreover, that the young classes [of recruits] of whom [the camps] were made up, perhaps because of their age, but also by reason of the exaggerated proximity in which they lived, suffered more from infections than the units occupying the trenches, units that contained older men." See Les maladies infectieuses pendant la guerre: étude épidémiologique, p. 17.

53See Chateau de Vincennes. Service historique de l'armée de terre. 5N268: Bulletin confidentiel, 15 November 1918. It was not just among yokels that these fears spread--similar rumors gained currency in Paris in September. See Bernard, La défense de la santé publique pendant la guerre, p. 154. These rumors were intensified by the smothering blanket of censorship: "On 13 February [1917] the list of items subject to censorship came to include articles published by the Académie de Médecine, which were not to mention the fact that mixing of corn and wheat flour could cause pellagra. Besides, having regard to the number of pregnant women engaged in employment, they should
As it proved impossible in these circumstances to restrict the movement of military personnel, most attempts to isolate the sick were in vain. More than the French or the British, however, the Americans persisted on this tack, going so far to barrack troops in tent camps in order to isolate potential 'flu cases. This, predictably, proved counterproductive—thousands of soldiers with symptoms of influenza were exposed to the soaking rains of early September and the chill autumn air, with inadequate provision for extra blankets and dry clothing. Nowhere was this better demonstrated than at the AEF First Replacement Depot at St. Aignan-sur-Cher, about thirty miles east of Tours, through which almost all American combat troops passed. Here troops received their field service equipment and advanced training prior to assignment to the zone of the armies; often in autumn 1918, 4,000 men passed through St. Aignan-sur-Cher per day. The Medical Corps at the depot originally decided to practice strict quarantine with incoming influenza cases—"The men who were found physically fit were permitted to proceed to their quarters. The sick were sent to hospital; contacts were investigated."54

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avoid publishing demoralizing statistics on the diminishing birth-rate and on infant mortality . . . and say nothing of the astonishing increase in syphilis since the war began."

(Ferro, *The Great War, 1914-1918*, p. 126)

Everywhere the duties of the Service were made more onerous by the necessity for doctors to provide treatment to civilians, despite the urgent need of these men in the Army. Still, as "in 1920 one-third of the country's departments did not have the inspectors of hygiene established by a law of 1902 [the law of 15 February]," the civilian health service in France was even more skeletal than that of the Army. See Zeldin, *France, 1848-1945*, ii, p. 635.

But sheer numbers and lack of facilities made this procedure unworkable: "The exposure to infection had been so general that to establish wholesale quarantine would have necessitated the keeping of tens of thousands of men at St. Aignan for weeks at a time, and would have held up military operations, as these men were urgently needed at the front. Moreover, an efficient quarantine was difficult, as the men were billeted throughout large areas, and frequently lived in houses occupied by civilian families. It was impossible to keep quarantined men so placed from coming into contact with outsiders. Frequently, less disease would be developed in the quarantined groups than among those outside quarantine." The best that the Medical Corps could do, therefore, was to isolate only the sick and their immediate contacts; shelter influenza cases in well ventilated barracks or tents; require head-to-foot sleeping arrangements to slow cough transmission; and issue masks to the hardest hit units.\(^{55}\)

\(^{55}\)Ibid.

\(^{56}\)Ibid., pp. 897-98. Gauze masks were widely used in the United States during the pandemic, but never caught on in France. Bernard claims to the contrary that "The whole civilian population did not feel a repugnance for the wearing of a mask that we, by a too easy generalization, are tempted to believe to be universal," and cites one instance in Burgundy where villagers, exposed to American troops using the masks, improvised some for themselves. Bernard concludes that "The memory of measures taken in the course of the great epidemics of the past is not, perhaps, irrelevant to the adoption of this device," but he offers no clue as to why so few French people did so. See La défense de la santé publique pendant la guerre, pp. 157-58n.

The AEF certainly believed in the masks--the American Red Cross responded to a call from the Chief Surgeon for over one-half million gauze masks and filled the order within two weeks. See Historical Division, Department of the Army, United States Army in the World War, 1917-1919. v. 19: Reports of Commander-in Chief, AEF, Staff Sections and Services. (Washington: Government Printing Office, 1948), p. 431.
Unable to segregate ‘flu victims in timely and effective fashion, the medical corps of the Allied armies had resort to ordinary remedies and medicines (principally camphor oil, oil of eucalyptus and aspirin) and to disinfection—the latter was the only prophylactic procedure for which they possessed the equipment and in which they had any faith. As influenza was widely believed to be a bacterial infection, the disinfectants employed were the usual sterilizing agents, including cresyl (a derivative of creosote), formaldehyde, sulfur and other, more arcane compounds. Indeed, many of the chemicals used for influenza disinfection were available in quantity in France precisely because they had been stockpiled at delousing stations.

In the end, the soldiers were more stymied by the pandemic of influenza than they had been by the epidemic of typhoid four years before. In the autumn of 1918 there were too many wounded moving down from the front, and too many troops and supplies moving up, to afford transportation for any but a small percentage of the sick. Even when the latter could be evacuated, there were too few hospitals, too few beds, and too few healthy doctors and nurses to care for them. The only remotely reliable means to ward off the fatal pneumonia that so often settled upon soldiers stricken with Spanish influenza was uninterrupted bed rest—the doctors of the various medical corps understood this—but the accelerating pace of the war in autumn 1918 provided scant opportunities to anyone for such rest.
The fonctionnaires of the Republic faced the same problems as their military counterparts, but had access to more expedients in the attempt to interdict the progress of Spanish influenza. These would eventually run the gamut from the closing of public facilities to new ordinances outlawing spitting in public, "... dry sweeping and the beating of rugs." 

On 18 September, in response to growing public concern—especially in Paris—the Minister of the Interior informed the prefects that influenza had been declared a notifiable disease; that, at their discretion, they could institute measures to effect the disinfection of public buildings and the isolation of 'flu victims; and, as a last resort, the prefects could order the closing of the schools and prohibit all public meetings. In Paris, several hundred influenza patients in the city's overcrowded hospitals were transferred to the public hospital in Nanterre. This was accomplished in ambulances and trucks borrowed from the American Red Cross, but the general transport crisis soon thereafter prompted the Prefect of Police to guarantee priority, or a reduced fare, on public transportation to the city's physicians. The Department of the Seine also arranged for Service doctors to be posted each night at barracks and police stations throughout Paris in order to aid

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58See Bernard, La défense de la santé publique pendant la guerre, p. 155. Prior to 18 September, notification for influenza had, according to the law of 15 February 1902 and the decree of 10 February 1903, been optional (la déclaration facultative); from that date notification was made mandatory (la déclaration obligatoire).

59Ibid.
civilians, though the blackout imposed upon the city under threat of bombardment by plane and long-range gun made night travel haphazard at best. On 8 October the Minister of Commerce informed the Prefect of Police that the Service de santé would deliver two and one-half tons of quinine to pharmacies in Paris, along with supplies of aspirin and benzoate of soda. And pharmacy students were assigned to selected pharmacists in the city to ensure that medicine could be delivered, especially at night.

The measures taken in Bordeaux were similar, and as urgent on account of the huge American presence in and around the city. On 8 October, the prefect of the Gironde, Olivier Bascou, after a meeting of the departmental Conseil d'hygiène, wrote to the Mayor of Bordeaux, granting the latter's request for authority to close all public places of amusement ("cinémas, théâtres, concerts, etc.") for the duration of the pandemic. Moreover, the Conseil suggested the closing of public and private schools and the cancellation of church services. Further, the Conseil "... indicated the urgent necessity to implement ordinary disinfection procedures on trams, in the stations, and in all public offices and places where crowds gather."
On 19 October, M. Bascou wired the prefect of the Rhône at Lyon, inquiring "... whether the decree ordering the closing of theaters and cinemas at Lyon had been useful and satisfactory." The following day, the Commissaire de Police of the suburb of Bègles warned the Prefect that "... mortality in the commune is quite high, and the present situation gives rise to very grave concerns." The pandemic pressed most heavily on the public consciousness in the Gironde, as elsewhere in France, during the last week of October. On 22 October the Prefect of the Gironde finally ordered the closing of theaters and cinemas, suspended classes in all schools until further notice, and ordered the cafés to close no later than 9:00 PM. On

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63 A. D. de la Gironde. 5M122: *Fermeture des théâtres, cinémas par mesure d'hygiène*. This telegram may serve, perhaps, as a useful indicator of the French obsession with secrecy during the war. It reads in the original:

Télégramme Chiffre 6

Vous serais obligé me faire connaître 8247 3943 si 5044 ordonnant 8373 3640 et 6105 à été 2192 18 et s'il a donné 2872.

Le Préfet

The Prefect in Lyon cabled back on 22 October to indicate that the closures had been vigorously enforced and had created no incidents. The telegram sent by the Prefect of the Rhône, oddly enough, was not coded. See *Ibid.*

Also on the 20th, the Prefect received the *bulletin hebdomadaire* from the sub-prefect of the arrondissement of Libourne, together with a cover letter apologizing for its lateness on account of the sub-prefect's own bout with the 'flu. See A. D. de la Gironde. 1M413: *Bulletins hebdomadaires.*

64 A. D. de la Gironde. 1M415: *Rapports mensuels*, 20 October 1918.

65 P. J. Flood, in his research on the war experience in the Isère, notes that 20% of civilian letters vetted in that department in October 1918 made reference to the Spanish 'flu. See his *France, 1914-18: Public Opinion and the War Effort*, p. 155.

the 25th the Prefect finally received some good news—a circular from the Ministry of Commerce addressed to the entire prefectural corps, informed the Prefects that each would soon receive 10 kgs of antipyrine and another 10 kgs of aspirin. The Prefect was encouraged to ensure the equitable distribution of the medicine to pharmacies throughout the prefecture, and see that it sold at the regulated price of 65 fr/kg for antipyrine and 27 fr/kg for aspirin.

The *rapports mensuels* for the remainder of October should have reassured the Prefect—his subordinates in the *département* indicated that the public appeared to be satisfied with the measures taken to combat the pandemic, and there were few complaints against the closings decreed on the 22nd. But there appears in the prefectural correspondence an undertone of worry, a sense of foreboding that influenza might only be a prelude to something worse. These officials knew by mid-October that a disease that theretofore had been only a nuisance was suddenly killing hundreds of people each week in the Gironde, and understood that too many of these were young adults.

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67 A. D. de la Gironde. 1M410: *Télégrammes*. Antipyrine is a fever reducer and pain reliever similar to aspirin.

64 See P. Guillaume, "La grippe à Bordeaux en 1918," p. 172.

69 The files containing the figures for disease mortality in the Gironde for the years 1917-1923 have disappeared from the departmental archives (and the loss is noted in the proper *liasse*).

In a report—the date is uncertain, but it is probably January 1917—submitted to the prefecture, however, Dr. Louis Hirigoyen noted that "We ordinarily tally 30-50 deaths per year as a result of influenza in Bordeaux. In 1915 there were only 3 such deaths, and for 1916 the figure was 37." See the A. D. de la Gironde. 5M114: *Rapport sur les épidémies qui ont sévi dans le Dép't. de la Gironde en 1916*. In 1918 influenza deaths totaled 2,558 in the Gironde. See the *Annuaire statistique*, v. 39, (1916-1918): p. 51.
phenomenon befuddled them—it did, of course, as it did officials elsewhere in France and around the world—the Spanish 'flu presented them with a problem they understood only too well: unburied bodies, and the epidemics of typhoid, cholera and dysentery that so often in the past had accompanied these. In the days before the backhoe, graves had to be dug by hand, and as so many men were sick with influenza, and so many others had been mobilized, there were not enough hands to do the work. The Commissaire spéciale for the city of Bordeaux informed the Prefect on 29 October that "... undertakers, in Bordeaux in particular, are stretched to the limit."70 This was true throughout France. In late November, the Prefect of the Isère authorized the Conseil municipal of the arrondissement of Buisse to propose the enlargement of the local church cemetery.71

Jean-Jacques Becker notes that in Paris in October "Rumour had it that the epidemic was even worse in the provinces, particularly in Lyon, where the dead were buried at night so as not to alarm the population."72 France was not alone in this respect. In Great Britain,

The reference to the extraordinary mortality among the young ("et y fait de nombreuses victimes principalement parmi la jeunesse et les pensionnaires des hôpitaux") appears in the rapport mensuel of the Commissaire spéciale of Bordeaux dated 29 October 1918. See A. D. de la Gironde. 1M415.

70See A. D. de la Gironde. 1M415: Rapports mensuels.


72See his The Great War and the French People, p. 319. As Becker provides no source for this rumor, it may just as well be the case that the authorities in the Gouvernement-militaire of Lyon conducted night burials, not in order to obscure the number of dead, but simply because their soldiers had to work round the clock to get all the bodies buried. The Annuaire statistique, v. 39 (1916-1918), p. 52, lists 2,348 as having died of influenza in the Department of the Rhône in 1918, but notes that the figure is based upon incomplete totals.
"Health-related services were worst affected, suffering high rates of staff absenteeism concurrent with a rapid increase in pressure on facilities. Similarly, the mounting number of deaths began to outstrip burial services, and undertakers began to refuse new orders. Bodies sometimes lay unattended for days, or even weeks, in themselves constituting a further health hazard." The only alternative for the Local Government Board was the resort to "... emergency burial services [to deal]... with the backlog of corpses. With local variations, this programme was adopted in America and the Dominions with remarkable uniformity, especially considering that in each case there was little central organization."

Then, as suddenly as the Spanish 'flu had descended upon Bordeaux, it disappeared. The pandemic peaked at the end of October and by the end of the first week of November fewer than twelve people were dying of 'flu per day. On 11 November the Prefect permitted the reopening of cinemas, theaters and concert halls for two days if the commissaires and sous-prêfets saw fit, and a week later the owner of the Café des

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73 Tomkins, "The Failure of Expertise: Public Health Policy in Britain during the 1918-19 Influenza Epidemic," pp. 441-42.

74 Ibid., p. 443. "Emergency burial services," one suspects, is a euphemism for mass graves. For examples from the American experience, particularly the difficulty in handling the dead in Philadelphia and San Francisco, see Crosby, America's Forgotten Pandemic, pp. 82-84, 95-99.

The problem of disposal was, for the moment, even more acute at sea aboard United States' troop transports, in which "By October 12 the situation had grown so bad that the directive requiring the return to America of the bodies of those who died at sea could not be obeyed. The AEF recommended that all troopships be equipped with extra caskets and embalming apparatus." (Ibid., p. 124) Despite this provision, hundreds of influenza victims would be buried at sea before the pandemic subsided.

75 See Guillaume, "La grippe à Bordeaux en 1918," p. 168.

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Variétés was pleading with the secrétaire-général of the prefecture to make the reopening permanent. On 20 November the Commissaire-spécial of Bordeaux reported that the number of 'flu victims had notably diminished since his report of 20 October. By 26 November the sous-préfet of Bazas reported that Spanish 'flu "... was at present only a bad memory," and that the people of his sub-prefecture were far more concerned about the lack of staple goods—especially coal, gasoline and potatoes—and the fairest order of demobilization (that is, married before celibate, those men with children before those without, and the older before the younger).

The Spanish 'flu reappeared in early December. The sous-préfet of Bazas informed the Prefect on 9 December that "I have to note only a certain recrudescence of the epidemic of influenza. The school for girls in Bazas had to be closed yesterday: the school has produced 36 cases of 'flu." By 14 December influenza was once again raging in the sub-prefecture of Bazas, while elsewhere in the department—in La Réole and Blaye, for example—the sous-préfets reported that all was quiet. By the 26th the 'flu had receded even from Bazas; the sous-préfet—suitably chastened, one imagines—reported that

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76 See A. D. de la Gironde. 5M122: Dépêche télégraphique officielle and Correspondance.

77 See A. D. de la Gironde. 1M415: Rapport mensuel.

78 See A. D. de la Gironde. 1M415: Rapport mensuel.

79 See A. D. de la Gironde. 1M413: Rapport hebdomadaire. And note that this time there was no delay—certainly not the two weeks that the department officials waited in October.

80 See A. D. de la Gironde. 1M413: Rapport hebdomadaire.
"Influenza . . . has disappeared; there is at present not a single case in the arrondissement of Bazas."

In retrospect, civilian officials in France had little better prospect of success than the soldiers. The crowding of the sick into hospitals could only have contributed to the virulence of the infection. The efforts at disinfection, when they were not entirely without value, must, by eliminating weaker bacterial strains, have resulted in the selection of more virulent strains of the bacteria (streptococci, staphylococci, pneumococci) that so often represented the deadly sequelae to Spanish influenza. In like fashion, the prescription of large quantities of quinine, antipyrine and aspirin could only have been counterproductive—these are fever reducers, and as the body's first line of defense against pathogens is an increase in temperature, the use of these drugs must have prolonged the

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81See A. D. de la Gironde. 1M415: *Rapports mensuels.*

82This was understood at the time. Léon Bernard noted that during the pandemic, the city of Lyon, for want of doctors and hospital beds, created a special corps of nurses (drawn from civil and military personnel) who provided home care. Home care had been, Bernard concluded after the pandemic, "... truly salutary. It is one of the rare measures capable of diminishing the mortality of an influenza epidemic." (See *La défense de la santé publique pendant la guerre,* p. 157)

83This need not always be the case, but usually is, even in hospitals. Reflecting on his studies of attendant-borne transmission of *E. coli,* Paul Ewald notes that "To terminate the outbreaks, hospital staff typically made intense, prolonged attempts to break the cycle of transmission by environmental decontamination. Certainly during these efforts the numbers of pathogens ingested must have been drastically reduced. Yet, severe infections persisted. Severe outbreaks were often eventually terminated only when the affected wards were closed and thereafter subjected to a comprehensive dousing with disinfectants." (*Evolution of Infectious Disease,* p. 90)

If it is so difficult in the 1990s to disinfect hospital wards effectively, it seems unlikely that early twentieth-century French municipal disinfection services could have hoped to do better on a town- or city-wide scale.
course of the illness itself, produced more ambulant hosts (by suppressing the symptoms) with longer infective periods, and permitted the survival of larger numbers of secondary bacteria.84

The fonctionnaires thus had no better luck than the doctors of the Service de santé militaire. Traditional medications and the usual sanitary procedures provided no defense against such a malignant manifestation of a mundane affliction. Hence, the officials—acutely aware of their failure, their helplessness—turned for answers and solutions to science, to the heroic bacteriology which in France was the legacy of Pasteur. And these were not shy, retiring scientists, but men—like Pasteur himself—determined, no matter the cost, not to let the Army and the Republic down.

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On the morrow of the war, a doctor assigned to the 21st Military Region recalled that the conflict had called into existence "... a sort of state of siege in matters of hygiene which pushed to one side a great number of dithering arguments and permitted the

84See Nesse and Williams, Why We Get Sick: The New Science of Darwinian Medicine, pp. 27-28, 35-36.

The use of fever reducers would, however, represent only a proximate explanation for the overall severity of the pandemic. Aspirin was synthesized in the Bayer laboratories in 1897, first marketed in 1899 and quickly became the twentieth century's first wonder drug. Aspirine 'Usines du Rhône' advertised at 1Fr. 50 for twenty tablets in the weekly "Les Annales" in Paris in autumn 1918 (in the same issues, "La Crème Activa," which "provoque une activité particulière de la vie des tissus," was trumpeted in the ads as "Radioactive"). Still, while there is no doubt that aspirin was widely dispensed in Western Europe and North America during the pandemic, there could have been but little aspirin usage in India where the highest influenza mortality was recorded in 1918.
immediate application of hygienic principles."  It was just this "... context of national emergency, and the cultural sense of desperate times, [that] created a social atmosphere in which drastic and extensive remedies and heroic efforts seemed appropriate in medicine as well as in war."  

Rarely, perhaps, have medical researchers been so reckless in the search for therapies, nor practitioners so promiscuous in the use of them: "Laboratory and clinic were joined. If some drug or serum was discussed in the Academy of Medicine then verified by one's fellow practitioner, one could use it with assurance and without fear of criticism. ... Local practitioners who tried new therapies and reported their results, did so by recording, in scrupulous detail, the development of symptoms in a handful of cases, often no more than two or three. Almost always the new treatment was deemed a success. The patient seemed to be snatched from death, or at least his death delayed; mild cases were prevented from becoming serious."  

Physicians experimented with a wide range of chemicals. These included stimulants such as adrenaline, strychnine, caffeine and digitalis; colloidal metals, especially silver and gold; and antiseptics such as "... camphor oil, ether, and urotropine. Guaiacol

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which had been recently involved in antituberculosis therapy, was thought of as having an antiseptic action also effective against influenza. There also was some experimentation with injections of ozonized turpentine. These multiple--and bizarre--regimens of chemotherapy were supplemented by immunotherapy. The pandemic produced a busy cottage industry devoted to creating influenza vaccines and anti-bacterial serums. Aside from the standard serums used to combat streptococci and pneumococci, injections of whole blood were used: "... blood was taken from the patient himself and re-introduced, and blood was taken from convalescent patients, filtered and citrated, and injected into

88Ibid., pp. 290-91. Hildreth makes the connection between the widespread use of stimulants during the pandemic and the persistence of vitalism in French thought and medicine: "The evidence for the positive effects of the chemical stimulants on the immune system was symptomatic: strengthened pulse, steadier heartbeat, and more regular respiration. These were the same observations which sustained the therapeutics of nineteenth-century vitalism, a connection which did not escape contemporary notice." (p. 289)

Hildreth notes that many of these drugs were administered by injection, even the colloidal metals: "Silver and gold were the most widely utilized. Both were usually injected: intravenous injection was said by some to be 'too brutal', but others claimed it was the only effective application." (Ibid., p. 291) Colloidal substances are those which, when suspended in solution, consist of particles significantly larger than atoms or molecules.

Physicians went even further afield in attempts to solve intractable problems. The stationary front in France resulted, for example, in enormous and thriving colonies of rats. As trapping and poisoning failed to reduce their numbers significantly, bacteriological warfare was resorted to in quick order: "The so-called rat virus of Danysz, probably Bacillus typhi murium (Loeffler), prepared by the Pasteur Institute, was employed to some extent but apparently without much success, and its use was soon prohibited, owing to a possible pathogenicity for man." (See Office of the Surgeon-General, The Medical Department of the U. S. Army, vi, p. 1071)

What Hildreth does not emphasize, but her article makes clear, is that these physicians, military and civilian alike, were extraordinarily needle-happy; indeed, would inject almost anything into anybody. In the heroic age of bacteriology, the doctors were not the only heroes.
other victims." Moreover, medical researchers did not confine their curiosity to human blood—"... there was experimentation with horse-serum from animals recovering from Pasteurellosis." In the final analysis, these experiments not only proved to be failures, but also served to muddy the water as they, "... added more confusion to the transmission question." Soldiers and civilians sickened and recovered--or died--despite the medical intervention of any agency or individual. William Carlos Williams, who "... made up to 60 calls a day during the pandemic," noted years later that "They'd be sick one day and gone the next, just like that, fill up and die."

In light of these failures, one is left with the impression that the French state, and its military and civilian medical establishments, not only did not mount a successful response to the pandemic, but could not have worsened the effects of the Spanish 'flu even had it tried--and the same verdict might apply to any other country's response to the pandemic. Yet France, the epicenter of infection, dodged the worst effects of the influenza of 1918. Moreover, it seems clear that the Republic's allies, which contributed

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89 Ibid., p. 292.


92 Quoted in Crosby, America's Forgotten Pandemic, pp. 316, 216.

93 Indeed, Sandra Tomkins' article, "The Failure of Expertise," might more accurately have been titled "The Futility of Expertise."
to a war effort that had left France all but prostrate, played a crucial role that enabled France to export the Spanish 'flu.

In the history of this pandemic, so honeycombed with contradictions and blind alleys, one anomaly in particular stands out. Belligerents and neutrals suffered alike. Switzerland's influenza mortality rate was higher than that of Germany and the equal of Great Britain's. Sweden's was almost as high as the latter's; Spain's was higher still. Yet in 1918 and 1919, France lost, at the maximum, 165,000 victims to Spanish 'flu.

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95 See Dupâquier, Histoire de la population française, iv, p. 5. Martha L. Hildreth accepts this number, noting that the pandemic was "... nowhere near as severe [in France] as in other parts of the world." ("The Influenza Epidemic of 1918-1919 :: France: Contemporary Concepts of Aetiology, Therapy, and Prevention." Social History of Medicine, v. 4, no. 2 [August 1991]: p. 278)

Dupâquier's figure appears to derive from Huber's calculations. Huber counted approximately 91,500 'flu deaths in 1918 and 35,300 in 1919 for a total of 126,800 (see La population de la France pendant la guerre, pp. 283-84). If one factors in the 43,500 deaths due to pneumonia in 1918, one arrives at an estimate of about 170,000 total deaths attributable to influenza. This is, however, a liberal estimate. Many 'flu victims in 1918 died with secondary pneumonic infections--this was the most salient characteristic of the mortality of the second wave--but clearly not all those who died of pneumonia in 1918 had first contracted influenza.

In all likelihood, the actual toll of Spanish influenza in France hovers between 135,000 and 150,000, but I will error on the side of caution and, henceforth, use Dupâquier's estimate of 165,000 total 'flu deaths in 1918-1919. French mortality the result of the pandemic thus lies somewhere between 3.25 and 4.0/1,000 population. The total also agrees with Jordan's estimate of 166,000. See his Epidemic Influenza: A Survey, p. 228.

It may be objected that these figures apply only to the 77 uninvaded departments, and that if the figures for the 10 invaded departments were included, the French mortality totals should rise to a level commensurate with those of neighboring states. Yet the population of the 77 uninvaded departments in 1918 well surpassed the total of 39.7
This figure is remarkably low. Great Britain, with a comparable population, lost at least 225,000 people to Spanish 'flu. The toll in the United States amounted to at least 550,000 (and probably as many as 675,000). Three hundred thousand died in Mexico; 250,000 each in Japan and South Africa, at least one-half million each in Russia and China, and 375,000 in Italy. Why so few in France?

The civilian population of France on 1 July 1918 stood at 32,830 million. Add to this a total of 4.1 million men in the armies of the line in France and in the Army of the Interior; 1.8 million men in the AEF; 1.9 million men in the BEF; approximately 350,000 prisoners of war; 1.6 million refugees from both Belgium and the invaded departments; and 450,000 foreign workers. The 77 uninvaded departments, therefore, hosted a population of just over 43 million people in autumn 1918—never before had France been so populous, nor in over a century had its population, thanks to the influx of Allied soldiers, been so weighted with young adults. The latter circumstance especially should have indicated higher influenza mortality in France. Nonetheless, even if one includes 'flu deaths among Allied soldiers in French totals, those totals are strikingly low as a proportion of the population. See Huber, *La population de la France pendant la guerre* pp. 105, 134, 185, 205; *The Medical Department of the U. S. Army*, xv, p. 82; *Statistics of the Military Effort of the British Empire, 1914-1920*, pp. 34-37; and Ministère du Travail. *Statistique générale de la France. Statistique du mouvement de la population*. Nouvelle série. Tome III: Années 1914 à 1919. (Paris: Imprimerie nationale, 1922), p. xxi.

Patterson and Pyle, by contrast, list a figure of 240,000 dead of influenza and 'flu-related causes in France, but as they cite no source, one suspects that this is an extrapolation from the mortality tolls of neighboring countries (i.e., several thousand more than in Great Britain, a few tens of thousands fewer than in Germany). See Patterson and Pyle, "The Geography and Mortality of the 1918 Influenza Pandemic," p. 15.

While it was, and perhaps still is true that "Illness and taxable property [in France] are alike in a sense: official records concerning them are not to be trusted," it was also true that the French state, in 1918 as in 1951, "... had a rather accurate idea of critical illness, and of course a perfectly accurate idea of illness resulting in death..." See Laurence Wylie, *Village in the Vaucluse*. Third edition. (Cambridge: Harvard University Press, 1974), p. 189.

The anomaly is the more interesting as France was one of the epicenters of the lethal, second wave, radiating influenza in all directions. The autumn pandemic appeared no later than 22 August at Brest among French and American military personnel (and probably appeared as early as the end of July) and at Freetown, Sierra Leone between 22 and 24 August, then arrived at Boston on the 27th. 97

Moreover, war-time changes in French demography and living conditions deepen the mystery. On the eve of the war, France was among the least urbanized western European countries and possessed a population density of fewer than 74 persons per square kilometer (the corresponding figure in England and Wales, by contrast, was 239; in Belgium and the Netherlands, 171; in Italy, 121; in Germany, 120). 98 A geographically

*October*: *The Impact of the Spanish Influenza Epidemic of 1918 on South Africa*, p. xv. Patterson and Pyle cite Jordan's figure of 450,000 for Russia, and Jordan's admission that this figure is a "shot in the dark." Their figures for China are 4.0-9.5 million (10.0-22.5/1,000). See Patterson and Pyle, "The Geography and Mortality of the 1918 Influenza Pandemic," p. 14-15.


France radiated 'flu in all directions, perhaps, but not with equal energy in every direction, as will become clearer below. There is anecdotal evidence that AEF troops transmitted the infection to German troops in July, but this was almost certainly the tail end of the mild first wave. See Ministry of Health Report on Public Health and Medical Subjects No. 4: *Report on the Pandemic of Influenza, 1918-19*, pp. 267-68. This report does not specify which American unit was responsible, and the rapidly increasing number of American units involved in the Aisne-Marne operation, serving with their own and French divisions, makes reconstruction of this contact all but impossible.

diffuse population and low population density ordinarily serve a state well in the face of an epidemic as they tend to retard the spread of infectious disease. The war, however, led to increased population densities—the migration from villages to cities, larger factories (and more of them), the concentration of troops, the accommodation of over 1.5 million refugees in departments away from the zone of the armies—so many people living, working and soldiering at closer quarters should have been increasingly susceptible to infection.\textsuperscript{99}

Worse, if French nutritional standards did not seriously decline during the war, living conditions surely did. The more than 20,000 refugees in Calvados and Morbihan probably found lodging on abandoned farms (frequently, one suspects, in out-buildings); workers and their families in towns with greatly enlarged munitions plants, such as Bourges, must have lived amid severe over-crowding; and everywhere people suffered from chronic fuel shortages, especially of coal and wood, for the duration of the war.\textsuperscript{100}

\textsuperscript{99}Dyer lists over 13,000 refugees in the department of Calvados (Normandy) by autumn 1915, almost 7,400 in Morbihan (Brittany) and over 5,500 in Isère (Dauphiné). The greatest concentration of refugees were found in the northern departments and around Paris. See Dyer, \textit{Population and Society in Twentieth-Century France}, p. 31.

\textsuperscript{100}Jay Winter seems to stumble over his own argument when he claims that Great Britain and France "... succeeded in maintaining war production without prejudice to the standard of living of the civilian populations.," but notes that "Even after the threat of early defeat receded, persistent [French] administrative hitches made it a constant struggle for ordinary people to feed, heat and (especially) clothe their families. As in Britain, housing conditions almost certainly deteriorated during the war." See "Some Paradoxes of the First World War," in Wall and Winter, eds., \textit{The Upheaval of War}, pp. 36-37. He is certainly correct, however, in concluding that neither British nor French civilians suffered privations of the same magnitude as those endured by civilians in Germany and Austria-Hungary.
These straitened circumstances of life, the over-crowding, the overwork (on the
farm as well as in the factory), the lack of fuel, the rationing of essential consumer goods,
ought, by standard reckoning, to have left French citizens more vulnerable to epidemic
disease.\textsuperscript{10}\ The eruption of a new, exceptionally virulent strain of influenza virus in France
in 1918 should have portended calamity—a calamity laid atop the already considerable
demographic burden of the war.

Yet the French suffered less from the visitation of the Spanish ‘flu, perhaps, than
any other people. The reason for this deliverance lies in the fact that in the late summer
and autumn of 1918, France experienced—it seems almost impertinent to write it—a stroke

\textsuperscript{10} This highlights another facet of the experience of the Great War that has been too
little remarked. The First World War required the immense and ceaseless labor of both
men and animals. Synthetic materials had begun to appear on the eve of the war—bakelite,
the first plastic, was patented in 1908. But the Great War was strictly an affair of iron,
steel, leather, concrete and wood, and in astonishing sizes and quantities.

Each of the armies on the western front (save the American) possessed artillery far
larger than any employed in the Second World War—the German 420mm siege mortar
fired shells weighing in excess of 2,500 pounds; the Austrian 17-inch shell weighed 3,000.
Machine gun companies required several days to belt their ammunition (by hand) in
preparation for an offensive. Trench works often had to be dug by hand with pack
shovels, and, as at Verdun, redug time and again under fire and the threat of gas. See

Beyond the railheads, all armies depended primarily upon animals and men for
transport. Although motor vehicles and draft animals were routinely requisitioned from
the civilian population by all European armies—civilians were thus thrown back upon their
own resources, as well—this provided at best temporary relief to the soldiers. The vehicles
were unreliable in the mud and cold of the western front, the maintenance of inventories of
spare parts for such \textit{ad hoc} fleets of vehicles almost impossible, competent mechanics too
few, and the wastage in horses and mules high. It is true that few more synthetic materials
in any quantity were available during the Second World War. But far more horsepower,
in the form of small, internal combustion engines (together with the refining capacity and
shipping tonnage necessary to provide the fuel) was available to do the work. The Great
War was, much more so than its second act, an exhausting and sleep-deprived contest of
muscle.

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of good luck. The clues to this luck also are to be found in April 1918, in two decisions so anti-climactic as to belie the secrecy with which they were surrounded. On 26 April General Pershing was cabled that, by order of President Wilson, "... the shipping of only infantry and machine gun units for four months was conceded [to the Allies], and it was hoped and believed that the number would be 120,000 per month." This was the amalgamation of American units into French and British divisions that Pershing had so stubbornly resisted, and represented the indefinite postponement of the creation of a fully-fledged American Expeditionary Force in France. The second decision was finalized the same day when "... Admiral Sir Alexander Duff ... recommended that the Admiralty adopt the convoy system" for Atlantic transport, a decision immediately followed by a request cabled to Washington for the necessary destroyers to make the system effective.

These decisions evidently resulted in the completion of a system of transport and communications that enhanced the mortality of Spanish influenza as it provided a large and ever-increasing pool of men who served as hosts for the infection (and therefore encouraged the natural selection of the more virulent strains of the virus), while at the same time creating the arterial system, along the lines of communication and supply established by the British and American expeditionary forces, through which France would

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export the Spanish 'flu in the autumn of 1918, and thereby minimize the ravages of the infection within its own civilian population.

Previous explanations have failed to support a coherent explanation for the mortality patterns of Spanish influenza—and especially for the anomalous mortality statistics recorded for France. The extraordinary death toll alone indicates that this visitation of influenza was *sui generis*. Moreover, the evidence insists that the virus's means of travel, and possibly its species origin, were unique in the epidemiological record, and that these circumstances significantly enhanced the virulence of the Spanish 'flu as it was propelled out of France, regardless as to whether the particular strains of virus present in 1918 were inherently virulent, which they almost certainly were. To begin to answer such questions, however, resort must be had to the lessons of evolutionary biology and evolutionary medicine. It is in the body of knowledge established in these disciplines that one can begin to construct a solution to the puzzle of Spanish 'flu.

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104 To recapture and isolate the virus of Spanish influenza would require clever seroarchaeology and luck. In 1951 Albert McKee led a team from Iowa State University to Alaska in order to take lung sections from victims of the pandemic who had been buried in the permafrost. McKee's team found a variety of bacteria frozen in their specimens, but no sign of influenza. See Beveridge, *Influenza: The Last Great Plague*, p. 79.

Two more recent attempts have been made or are planned. Research pathologists at the Armed Forces Institute of Pathology in Washington claim to have isolated an H1N1 virus from an old tissue sample taken from a soldier who died at Ft. Jackson, South Carolina in September 1918. And a Canadian team has made plans for the summer of 1998 to exhume the bodies (and extract samples of RNA from the tissues) of coal miners in the Norwegian Arctic who died of influenza in the first week of October 1918 and were buried, presumably in the permafrost layer (i.e., at least 1.2 meters deep) outside the village of Longyearbyen. For these endeavors, see, respectively, S. Sternberg, "A Doughboy's Lungs Yield 1918 Flu Virus," *Science News*, v. 151, n. 12 (22 March 1997): p. 172; the *Columbus Dispatch* (21 March 1997): p. 6A; the *Columbus Dispatch* (20 May 1996): p. 4A; and Malcolm Gladwell, "The Dead Zone," pp. 52-65.
When Charles Darwin died Wednesday afternoon, 19 April 1882, a copy of Gregor Mendel's 1866 paper on heredity—posted to Darwin by Mendel himself—lay on a shelf in his study, "apparently unread." Mendel's work on genetic inheritance should have given Darwin the mechanism he sought, the one by which, through linking the general to the particular, his evolutionary theory could have been made, if not complete, at least demonstrably operative and coherent.¹

¹See Philip Kitcher, *Abusing Science: The Case Against Creationism*. (Cambridge: The MIT Press, 1982), p. 9. Mendel's discoveries eliminated the need to consider the possibility of "blended inheritance," which, because of the dilution of inherited characteristics, would all but obviate any possibility of evolution, in favor of "discrete inheritance." By this latter process, information coded within genes (Mendel's "factors") is passed from one generation to the next.

In *On the Origin of Species by Means of Natural Selection, or the Preservation of Favored Races in the Struggle for Life*. Sixth edition. Two volumes. (New York: D. Appleton and Company, 1899), Darwin repeatedly confessed bafflement on this subject, concluding that "Variability is governed by many unknown laws . . . Our ignorance of the laws of variation is profound." (i, pp. 49, 203) But if Darwin did not possess the right answers, his study of domestication and breeding had begun to suggest the right questions: "The laws governing inheritance are for the most part unknown. No one can say why the same peculiarity in different individuals of the same species, or in different species, is sometimes inherited and sometimes not so; why the child often reverts in certain characters to its grandfather or grandmother or more remote ancestor, why a peculiarity is often transmitted from one sex to both sexes, or to one sex alone, more commonly but not exclusively to the like sex." (i, p. 15)
Still, the lack of a mechanism for discrete inheritance proved a formidable barrier to the ready acceptance of Darwin's work: "Assuredly, there was at the root of all this confusion a fundamental ignorance of the true mechanism of inheritance. But Darwin's conclusions drawn as a result of his investigations into the causes of variation were to have the greatest effect in undermining his own idea of natural selection. When he recognized so many external factors as producing permanent inheritable effects, he opened a veritable Pandora's box of chimeras, most of which he was not to face until long after the Origin's appearance. . . ." (See Peter J. Vorzimmer, Charles Darwin: The Years of Controversy. The "Origin of Species" and Its Critics, 1859-1882. Philadelphia: Temple University Press, 1970, pp. 19-20.)

That Darwin failed to comprehend the mechanics of inherited variation, yet was never budged from his concept of natural selection, highlights an important point in the philosophy of evolutionary science: "Darwin, in effect, treated the inner workings of heredity as a black box. All he needed to support his idea of natural selection was the realization that there is heritable variation within species. And though he himself quite naturally wished to understand the biological basis of heredity, his desire to do so actually says nothing of the importance of such knowledge to the formulation of the concept of natural selection. That he got it wrong merely underscores the independence between the mechanics of heredity and the process of natural selection." (See Niles Eldredge, Reinventing Darwin: The Great Debate at the High Table of Evolutionary Theory. New York: John Wiley & Sons, 1995, p. 14.)

Darwin's theory had to skirt another pitfall (aside from the religious objections)—the social Darwinists, led by Herbert Spencer, quickly and avidly misconstrued Darwin's work; pace Spencer, individuals do not merely struggle to survive; individuals also struggle to survive in order to reproduce. Moreover, Darwinian evolution—Darwin's phrase was "descent with modification" (the word "evolution" did not appear in the Origin of Species until the sixth edition of 1872 [the last to be corrected by Darwin himself], and Darwin had not employed it before it appeared in his The Descent of Man in 1871 [See Derek Gjertsen, The Classics of Science: A Study of Twelve Enduring Scientific Works. New York: Lilian Barber Press, Inc., 1984], p. 353, n. 53])—works only at the level of individuals, not at the species level (except in the case of some viruses—as will be made clear below, influenza is one of these), and certainly not at the level of nations or races. For the reception of Darwin's work, see T. H. Huxley's "On the Reception of the 'Origin of Species,'" in Francis Darwin, ed., The Life and Letters of Charles Darwin. Two volumes. (New York: D. Appleton and Company, 1899), i, pp. 533-58.

The religious objections to Darwin's work cost him much time in letter writing, but less trouble: "The old argument from design in Nature, . . . which formerly seemed to me so conclusive, fails, now that the law of natural selection has been discovered. . . . There seems to be no more design in the variability of organic beings, and in the action of natural selection, than in the course which the wind blows." (Ibid., pp. 278-79) The contention that suffering is designed to encourage moral improvement also failed the test: "This very
Nonetheless, the principles that buttressed the theory as elaborated in *Origin of Species* were remarkably simple and in accord with common sense:

1) nature is prodigal, in that all species tend to reproduce in numbers too large to be supported by the environment.

2) it follows, therefore, that most offspring must die.

3) those that survive must struggle against many competitors to do so.

4) individuals within a species vary in many respects.

5) those individuals whose variations enable them to take the best advantage of their circumstances will be naturally selected to survive to reproductive age over those whose variant features are either debilitating or merely neutral.²

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²See Edward O. Dodson, "Evolution," in Peter Gray, ed., *The Encyclopedia of the Biological Sciences*. Second edition. (New York: Van Nostrand Reinhold Company, 1970), p. 305. Darwin put it even more succinctly in *Origin of Species*: "As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected." (See *Origin of Species*, i, p. 5. The emphasis is Darwin's.)

It is ironic that Darwin's "descent with modification" should have proved to be the object of enduring controversy. As Richard Lewontin has pointed out, "Many of the most fundamental claims of science [among them the dual nature of light] are against common
Darwin was not the only scholar to overlook Mendel's contribution. Only at the turn of the century did the paper begin to receive citations in scholarly work, but once Mendel's genetic theory was rapidly disseminated, rather than augmenting Darwin's work, Mendelian genetics all but displaced Darwinian selection, as laboratory researchers postulated that evolution was the sole result of spontaneous mutation (a process termed "saltation"): "The potential for a synthesis with Darwinism was not recognized at first because the early geneticists went so far as to claim that the environment could have no effect, not even indirect, upon evolution. . . . Genetics at first merely contributed to the eclipse of Darwinism in the years around 1900."3


Darwin himself appeared surprised at the quantity and ferocity of the invective his work elicited, and admitted in a letter to J. D. Hooker in May 1860 that "I see plainly that it will be a long uphill fight." For this long slog he was inclined to hold himself at least partly responsible: "I must be a very bad explainer. . . . I suppose 'natural selection' was a bad term; but to change it now, I think, would make confusion worse confounded, nor can I think of a better; 'Natural Preservation' would not imply a preservation of particular varieties, and would seem a truism, . . ." (See Francis Darwin, ed., The Life and Letters of Charles Darwin, ii, pp. 101, 111.


Darwin surely should have avoided this difficulty--he observed the watchwords "... 'Natura non facit saltum' [Nature does not make jumps]. We meet with this admission in the writings of almost every experienced naturalist; or as Milne Edwards has well expressed it, Nature is prodigal in variety, but niggard in innovation." (See Origin of Species, i, p. 244.) In many respects Darwin appears to have simply died too young--just before the germ revolution, before the advent of radiocarbon or potassium-argon dating, on the eve of the creation of graduate education in the natural sciences.
Only in 1930 did R. A. Fisher, with his *Genetical Theory of Natural Selection*, finally begin the task of integrating Mendel's work on genetic inheritance with Darwin's evolutionary hypothesis and, with J. B. S. Haldane and Sewall Wright, lay the foundation for the modern evolutionary synthesis. Progress was only fitful in the 'twenties and

Saltation remains a subject of occasional dispute within evolutionary biology—controversy still erupts over the frequency and importance of "hopeful monsters" in the process of adaptation. Darwin, as have most twentieth-century biologists, reasoned against their significance: ". . . I have reflected much on the chance of favourable monstrosities (*i.e.,* great and sudden variation) arising. I have, of course, no objection to this, indeed it would be a great aid, but I did not allude to the subject, for, after much labour, I could find nothing which satisfied me of the probability of such occurrences. There seems to me in almost every case too much, too complex, and too beautiful adaptation, in every structure, to believe in its sudden production. . . . Monsters are apt to be sterile, or not to transmit monstrous peculiarities." (See Francis Darwin, ed., *The Life and Letters of Charles Darwin*, ii, p. 126. The emphasis in the last line is Darwin's.)

Haldane, Fisher and Wright established the field of population genetics and set it on an empirical, mathematical foundation. Wright supplied the mathematics, Fisher proved that natural selection would maintain genetic variation in a large population, and Haldane demonstrated with his work on peppered moths that natural selection, in a given environment, can rapidly winnow maladapted individuals from a population. See *Ibid.*, pp. 464-67.

Evolutionary biology is a vast and sometimes difficult subject, but a brief summary of work in this field is required in order to clarify the direction and substantiate the hypothesis of this paper. It is a difficult subject precisely because its aim is fundamentally different from that of standard biology: "Biologists have long tried to figure out the evolutionary origins and functions for organismic characteristics, but it has taken a surprisingly long time to realize that this enterprise is fundamentally different from trying to figure out the structure of organisms and how they work." (Nesse and Williams, *Why We Get Sick*, p. 241) In other words, biologists since Aristotle have attempted to explain how organic structures function. Evolutionary biologists try to determine why an organism possesses its structure in the first place—and in what ways and why that structure might have changed, or will change, over time.

One of the better concise introductions to the history and development of Darwinian evolution the writer has discovered is Kitcher's, "Evolution for Everyone," the first chapter of his *Abusing Science*, pp. 7-29. Kitcher's essay, a marvel of lucid exposition and reasoned argument, surveys a large, treacherous topic without sacrificing too much accuracy to brevity. Better still is the first chapter ("Setting the Table") of Eldredge's *Reinventing Darwin*. 

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'thirties because field researchers were overwhelmed by the mathematics of the population geneticists and disaffected by the geneticists' underestimation of both the influence of the environment in natural selection and the magnitude of variation within species.5

The synthesis of Darwin and Mendel was only consolidated at mid-century by Theodosius Dobzhansky, G. G. Simpson, Ernst Mayr and Julian Huxley. Their work produced the modern synthesis, or neo-Darwinism. This system stipulates that individuals within species evolve by means of variable genetic inheritance through a process of adaptation driven by natural selection; in geographic isolation, variant individuals may, over time, branch off and form new species.6

5"The evolutionary synthesis emerged when the findings of population genetics were translated into terms that could be used by a field naturalist with no mathematical background. But at the same time, population genetics itself would benefit from the naturalists' emphasis on the role of geographical factors and the need to take into account the ways in which migration and isolation can break up a once-uniform population." (Bowler, The Norton History of the Environmental Sciences, pp. 468-69)

6The beginnings of the collaboration (and eventual struggle) between laboratory geneticists and field naturalists was largely the result of Dobzhansky's ability to explain the principles of population genetics clearly to non-mathematicians in his book Genetics and the Origin of Species (1937); Simpson applied the neo-Darwinist synthesis to paleontology; "Mayr's Systematics and the Origin of Species of 1942 emphasized the role of geographical factors in speciation," and Huxley attempted to explain it to a general audience. See Ibid., pp. 470-72; see also Peter J. Bowler, Evolution: The History of an Idea. (Berkeley: University of California Press, 1984), pp. 298-99; Kitcher, Abusing Science, pp. 17-24; and Eldredge, Reinventing Darwin, pp. 17-30.

Although the modern synthesis enjoys consensus support among biologists, many disputes remain—those over the legitimacy and value of sociobiology and evolutionary psychology have produced bitter exchanges. The most contentious one, and that with the deepest roots, concerns both the pace of evolution and the relative importance of genes and populations, as opposed to individuals and species, in the process of natural selection. This pits Richard Dawkins (The Selfish Gene [1976, 1989]), the doyen of British evolutionary biology, John Maynard Smith, along with Daniel Dennett (Darwin's Dangerous Idea: Evolution and the Meanings of Life [1995]), among others, many of them population geneticists, against Stephen Jay Gould, R. C. Lewontin, Elisabeth Vrba...
and Niles Eldredge, with many others (and many of these naturalists or paleontologists) taking an occasional turn in the lists.

Dawkins is an "ultra-Darwinian" (a phrase both Gould and Lewontin have applied to their opponents)—he believes that genes, through a gradual process, play the exclusive role in natural selection, that they are the engine that drives and determines the course of the entire process. The individual is a cipher, a mere vehicle in the unfolding of evolution. It is genes ("selfish genes") that are selected, or not, and this process is algorithmic, accomplished entirely by rote, with a role for neither contingency nor accident—Dennett uses the metaphor of the crane, slowly but inexorably building adaptations: first into genes, then individuals, then species, then, gradually, new species.

Gould, along with his partisans, has for a quarter-century argued that evolution proceeds by fits and starts, in a process he and Niles Eldridge dubbed "punctuated equilibrium." (See their "Punctuated Equilibria: an alternative to phyletic gradualism," in T. J. M Schopf, ed., Models in Paleobiology. [San Francisco: Freeman, Cooper, 1972].) Eldredge has reproduced the article in the Appendix to his Time Frames: The Rethinking of Darwinian Evolution and the Theory of Punctuated Equilibria. [New York: Simon and Schuster, 1985].) Organisms tend to evolve in spurts, and rapidly (that is, rapidly in the course of geologic time) for a variety of reasons—outside influences (the meteorite that struck the Yucatan 65 million years ago, for example), genetic mutation, climatic change—and having achieved evolutionary equilibrium, tend to remain stable. The element of contingency and the apparent abandonment of gradualism here drive the ultra-Darwinians to distraction.

Gould and Lewontin have also argued that evolution has non-adaptive side consequences (the "spandrels of San Marco" served as their first metaphor for these non-adaptive side consequences of natural selection; Darwin referred to these as "correlations of growth")—these, along with "coopted functions," (i.e., organs naturally selected for one purpose employed for yet another purpose) insert happenstance into the process of evolution, rendering it unpredictable, hence not algorithmic.

Eldredge, in his Reinventing Darwin (p. 184), has attempted to bring the debate to a head, arguing that "An ultra-Darwinian may wish to see ecosystems as the products, the natural fallout, of competition for reproductive success," but "... organisms do basically two (and only two) kinds of things: they engage in matter-energy transfer processes, and they reproduce." In other words, the evolutionary fate of an organism (and, hence, a species) is determined not only by its reproductive success, but also by how it lives. These are, in Eldredge's terms, an organism's "genealogic" and "economic" functions, respectively. The ultra-Darwinians have responded with either charges that the naturalists have fallen into the saltationist trap (that is, the view that evolutionary change occurs through sudden, large-scale alterations in organisms—this would amount to the abandonment natural selection), or that they have overemphasized the speed of evolutionary change—Dawkins has referred to the theory of punctuated equilibria as "rapid gradualism." (See his Climbing Mount Improbable. [New York: W. W. Norton & Company, 1996], pp. 105-06.)
Neither faction in this dispute argues with the preeminent place of natural selection in determining the direction of evolution—Gould has referred to it as primus inter pares among the engines of evolutionary change, while his opponents claim it as the only force for such change. Darwin himself, in Origin of Species (ed. 1899, i, p. 6), allowed that "I am convinced that Natural Selection has been the most important, but not the exclusive, means of modification." Darwin never wavered, however, in his commitment to gradualism. But because the questions are so complex and important for the direction of future research in evolutionary biology, and because the evidence—primarily from the fossil record—must be inferred, the debate has become exceptionally bitter, sometimes childishly so. Lewontin has referred to Dawkins's "vulgar Darwinism"; Gould has taken to describing the ultra-Darwinists as "Darwinian fundamentalists," and himself as a "pluralist." (See Gould's articles "Darwinian Fundamentalism" and "Evolution: The Pleasures of Pluralism," in, respectively, the New York Review of Books, v. 44, no. 10 [12 June 1997]: pp. 34-37, and no. 11 [26 June 1997]: pp. 47-52.)

The other side has been no kinder. Dawkins has allowed that "I think the tendency of American intellectuals to learn their evolution from him [Gould] is unfortunate, and that's putting it mildly." (See Ian Parker, "Richard Dawkins's Evolution," The New Yorker [9 September 1996]: p. 45.) Dennett has devoted an entire chapter ("Bully for Brontosaurus") in Darwin's Dangerous Idea an effort to debunk Gould's ideas—adding archly that rumor has it that Gould refuses to use a word processor. Eldredge, in his Reinventing Darwin, has, in an attempt to clarify the points at issue in the dispute, produced another naturalist polemic, but one deliberately devoid of rancor. It remains to be seen whether the geneticists take the olive branch as an offer of reconciliation—or as a sign of weakness.

This dispute is instructive in that, while all academic fields are riven with old disputes, in evolutionary biology these can rarely be decisively resolved precisely because of the ambiguity of the available evidence. The frustration is exacerbated by the tenuous place of biology among the exact sciences (a self-consciousness that often manifests itself among biologists as "physics envy"), where proof—expressed in mathematical notation—is prized above all else.

A viral epidemic eight decades ago surely qualifies as part of the fossil record, and the fossils are documents. But the great rift that divides the community of evolutionary biologists can be safely skirted. As influenza is a virus, it occupies only one of Eldredge's "...separate realms of interactors and more-makers." (Reinventing Darwin, p. 192) Viruses do not possess "economic" lives; that is, they do not "...actively seek energy and materials in order to be alive: to differentiate, grow, and maintain the living corpus." (Ibid., p. 193) Rather, as the influenza virus only fulfills one function—the genealogical one—the alterations in its genome and its opportunities to replicate are crucial to its evolutionary fate. At the level of the virus particle, the ultra-Darwinian interpretation of the evolutionary process obtains, as even Eldredge admits: "Only when organisms consist of but a single cell [and influenza particles are not even so large as this] can we say that the hierarchy collapses and the cell/organism is both interactor and reproducer." (Ibid., p. 128)
It must be emphasized, however, that this process is mindless. Natural selection proceeds without a goal, has no target, "... occurs not toward anything ... but only away from something," that is, not toward greater fitness, but away from lesser fitness—if a way turns up. If sufficient individuals within a species, under pressure, cannot stumble upon greater fitness, then the extinction of the species looms as a probability. And because the process is a mindless one, serendipity will frequently play a role: "Chance can influence the outcome at each stage [of evolution]: first in the creation of a genetic mutation;  

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The quote is from an interview with Thomas S. Kuhn in *Scientific American*, v. 264, no. 5, (May 1991): p. 49. The concept of the mindlessness of evolution is a favorite of Dennett in his *Darwin's Dangerous Idea*. See also Lappé, *Evolutionary Medicine*, p. 40. Richard Dawkins has perhaps put it best: "Natural selection ... has no purpose in mind. It has no mind and no mind's eye. It does not plan for the future. It has no vision, no foresight, no sight at all. If it can be said to play the role of watchmaker in nature, it is the blind watchmaker." (See his *The Blind Watchmaker: Why the evidence of evolution reveals a universe without design*. [New York: W. W. Norton & Company, 1987], p. 5)

One of the obstacles to a coherent explanation of natural selection is the difficulty in creating metaphors for mindlessness; it is human nature, perhaps, upon finding no agency, to assign it—or merely assume it. In Steve Jones' apt phrase, "Evolution is to allegory as statues are to birdshit." (See his review of Jared Diamond's *Why is Sex Fun? The Evolution of Human Sexuality*, in "Go Milk a Fruit Bat," *New York Review of Books*, v. xlv, no. 12 [17 July 1997]: pp. 39-41)

Indeed, it is difficult to describe this process accurately even when one encounters a clearcut case in nature. Consider Nesse and Williams' example of the monkey species: "... some kinds of South American monkeys can grasp branches with their tails. This trick would surely also be useful to some African species, but, simply because of bad luck, none have it." (*Why We Get Sick*, p. 18) This is true as far as it goes, but the last phrase should read "none have it yet."

All this is not to say that evolution is entirely at the mercy of the odd genetic mutation: "Contrary to a widespread notion, evolution does not so much follow the vagaries of chance mutations—although this may occasionally happen—as do mutations wait, so to speak, for an opportunity to affect the course of evolution." (Christian de Duve, "The Constraints of Chance," *Scientific American*, v. 274, no. 1, [January 1996]: p. 112)
second in whether the bearer lives long enough to show its effects; third in chance events that influence the individual's actual reproductive success; fourth in whether a gene, even if favored in one generation, is, by happenstance, eliminated in the next; and finally in the many unpredictable environmental changes that will undoubtedly occur in the history of any group of organisms.*

Hence, natural selection operates among all organisms, but observes different rules, provides different benefits, and imposes different costs according to their reproductive methods. Species that employ sexual reproduction can more readily maintain genetic variation within small populations. Parthenogenesis, where the female can produce a new generation without fertilization, would provide greater benefits for a species (through more timely and/or more frequent reproduction), but create individuals who are "... vulnerable to any pathogen that discovers the key to exploiting this bonanza of susceptible individuals. If a clone of ten thousand parthenogenetic women [for example] are all vulnerable to influenza, they might all be wiped out by the next epidemic, which would claim only some of their genetically diverse competitors."®

Bacteria, by contrast, multiply most often through binary fission. Here the opportunities to achieve genetic variation are fewer than in meiosis (division within sex cells, or gametes) or mitosis (asexual cell division), but bacteria can afford this disability as

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*Nesse and Williams, *Why We Get Sick*, p. 17.

*Ibid.*, pp. 183-84. Sexual reproduction possesses the further benefit of hiding many harmful genetic variations in alleles (alternative forms of genes) that are recessive. All variants deadly for children, when these variants survive, do so as recessive traits--otherwise these traits would be eliminated as the carriers would be far less likely to pass them on to the next generation. See Lappé, *Evolutionary Medicine*, p. 45.
they appear to suffer fewer parasites than more complex forms of life and possess the advantage of enormous numbers guaranteed by rapid reproduction. As bacteria can produce hundreds of generations in a matter of weeks, variation in the genome is assured and natural selection and evolution are accelerated.\textsuperscript{10}

Here again, the virus is a special case. As it is only a particle composed of genetic material and proteins, reproduction through cell division is unavailable to it; hence, the virus needs to invade a host cell and turn the host's reproductive machinery to its own purposes. This parasitism provides benefits. The virus is freed of the burden of supporting a reproductive apparatus--parasites tend to travel light--nor need it metabolize its own energy in order to reproduce. But parasitism also imposes costs, principal among them the imperative that the virus find a host in order to replicate.

Therefore, the virus's means of transmission--its vector--is all important. As noted above, a sit-and-wait virus, such as smallpox, one that can survive outside a host, will tend towards virulence--whether the host lives or dies is of little consequence to the virus as the death of the host does not necessarily mandate the reproductive failure of the virus.

\textsuperscript{10}See \textit{Ibid.}, pp. 52-57, 184. Nesse and Williams point out that the best evidence of accelerated evolution among bacteria is found in the growing bacterial resistance to antibiotics: "Consider staphylococcal bacteria, the most common cause of wound infection. In 1941, all such bacteria were vulnerable to penicillin. By 1944, some strains had already evolved to make enzymes that could break down penicillin." (p. 53) The speed of evolution in this period is the more remarkable when one considers that the use of penicillin was for the most part restricted to the armed forces, and was not generally available to civilians until after the Second World War.

Nesse and Williams add that the typical bacterium can produce 300 generations in as little as two weeks, and that "Bacteria can evolve as much in a day as we can in a thousand years. . . ." (p. 51)
Viruses transmitted by insect vectors—yellow fever is one of the best examples—can be even more virulent. The yellow fever sufferer, exhausted by illness, is less likely to ward off the mosquitoes that enable the virus to find new hosts. In this case, the host’s death is of no consequence at all—many virus particles will die with the host, but recall that the virus has expended little energy in creating those particles, and nature tends to prodigality and profligacy. The person dying of yellow fever provides a launching pad for the most virulent strains of the virus which crowd out (through successful reproduction) any strains that may be less virulent; hence, the most virulent strains of any vector-borne virus, all other circumstances equal, are routinely naturally selected.\(^1\)

Viruses whose vector is personal contact or airborne transmission, however, tend towards reduced virulence because these viruses ordinarily need mobile hosts in order to find new susceptibles. Here the best examples are found in the large group of rhinoviruses (over 100 have been identified) which produce the common cold: "If you are so sick from a cold that you stay home in bed, you are unlikely to come into contact with many people that your virus might infect. If you feel well enough to be up and about, you may be able to disperse it far and wide. It is very much in a cold virus’s interest to avoid making you really sick."\(^2\)


\(^2\)Ibid., pp 58-59. See also Ewald, *Evolution of Infectious Disease*, p. 63, and "The Evolution of Virulence," p. 90. It is not yet clear whether the runny nose characteristic of a cold is a manipulation of the host to spread the virus, or a host defense to expel pathogens, though Nesse and Williams (p. 36) lean towards the former explanation.
The influenza A virus also functions as a "walk-about" infection. Hosts with subclinical cases ordinarily afford the virus access to new hosts, and the virus benefits as well from those whose cases are presymptomatic. But the similarities between the rhinoviruses and the influenza virus beg the question. How does one explain the much greater virulence characteristic of influenza? How does one account, in particular, for the extraordinary mortality of Spanish influenza? Most of all, how can one explain the anomalous French mortality figures at the center of this storm of infection? Recent work in the microbiology of viruses and in evolutionary epidemiology provide an answer.

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Viruses, if life they be, are indeed a peculiar form of life. Manfred Eigen's work on viral behavior reinforces this notion, but suggests that this is so for a startling reason. Unlike any other known life form, viruses practice a form of "herd evolution"; that is, they respond so quickly to genomic change and environmental opportunity as to mimic group selection, and this is so because viruses are not species, but quasispecies.

Note also that Nesse and Williams, particularly as their book was written for a general audience, once again cannot resist the anthropomorphic image. Cold viruses, of course, do not have an interest in a host. The rhinoviruses tend towards benignity because more virulent strains are naturally selected against—virulent colds would land the host in bed and so reduce or eliminate the opportunity for the virus to migrate to new hosts.

13The threshold for detectability of influenza A infection is a concentration of about one billion particles. See Eigen, "Viral Quasispecies," p. 45.
All species possess a wild type, "... the form that predominates in a population and that is particularly well suited to the environment in which it lives." As a result of the inability of the influenza virus to replicate itself accurately, however, its wild type is surrounded by a multitude of variants, and the wild type together with its variants constitute the quasispecies. This is a "... region in sequence space [that] can be visualized as a cloud with a center of gravity at the sequence from which all the mutations arose. It is a self-sustaining population of sequences that reproduce themselves imperfectly but well enough to retain a collective identity over time."

The cloud maintains its integrity because the greatest number of new mutants appear around the wild type; this is logical as the wild type is, by definition, the most successful strain—because of its ability to reproduce itself—of the virus. Those less fit are selected against and disappear; only those variants that are more fit or neutral survive—but these alter the shape of the cloud. If the previous wild type is replaced by a fitter mutant, then not only will the shape of the cloud alter, so will the center of gravity of the species in

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"Eigen, "Viral Quasispecies," p. 44. Eigen adds that the "... view of the wild type accords with the classical model of natural selection. Although mutations occur steadily, they presumably disappear because the mutant types are less fit than the wild type. Alternatively, a mutant may have advantages, in which case it becomes the new wild type. Either outcome tends to keep all the members of a species at or very near one point in a genome sequence space." (Ibid.)"

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"Ibid., p. 45. A sequence space is composed of all the mutations accumulated within a genome, with each mutation one jump, or sequence, removed from the previous one. Eigen's physical representation of such a space is a hypercube, a three-dimensional space observed through time. See Manfred Eigen with Ruthild Winkler-Oswatitsch, Steps Towards Life: A Perspective on Evolution. Translated by Paul Woolley. (Oxford: Oxford University Press, 1992), p. 94."
sequence space. It is this ability of natural selection to take rapid advantage of influenza's vast number of mutations that forms the crux of influenza's slippery character. And this hypothesis, in turn, best illustrates Kilbourne's observation that "Rather, in the long view, their [influenza viruses'] identities are ephemeral; they are at best transiently stable packages of genes borrowed from an extended gene pool."

Eigen's crucial contribution, however, is the connection his work makes possible between the sequence space occupied by a genome, and the fitness landscape occupied by a species. The latter concept was developed by Sewall Wright in the 1920s as a means to model the habitat in which natural selection operates on a species—such a landscape favors some mutations over others. In most instances, as the fitness landscape changes only by small increments, natural selection responds to these changes with gradual, incremental pressures applied to individuals and, therefore, to species. When the fitness landscape changes abruptly—as happened in the mass extinctions of 245, 65 and 35 million years ago—entire classes of species, unable to respond rapidly with increased fitness, will be driven to extinction.

The influenza virus, however, can respond quickly to an altered fitness landscape because it can evolve so rapidly through its sequence space in what Eigen terms the

16Kilbourne, Influenza, p. 141. See also Eigen, "Viral Quasispecies," p. 45. For a more technical treatment, see Eigen and Winkler-Oswatitsch, Steps Towards Life, pp. 22-30 and 82-86.

This notion again raises the possibility that influenza A might at some future time completely lose its integrity, and cease to be a pathogen—that the virus could inaccurately replicate itself into extinction (see above, p. 93, n. 26). Eigen suggests that because some positions on its genome must be constant, "... the influenza A virus will probably remain a pathogen, ... but we cannot predict what its pathology will be." ("Viral Quasispecies," p. 47.)
"evolutionary ridge walk." That is, "... mutation jumps are possible, so that from each point [ten billion] or more points within reaching-distance can be scanned. So evolution in multi-dimensional space has a very good chance of finding a continuous route of small steps to the highest peak of the value landscape [i.e., of evolutionary fitness]."

The burden of further research, therefore, must be to make the connection between these theoretical considerations and their schematic representations, and the behavior of the Spanish 'flu in France in 1918. Paul W. Ewald, a pioneer in the field of evolutionary epidemiology, has written briefly on the subject of the pandemic of 1918-1919 and noted that "The environmental conditions associated with the trench warfare of World War I could hardly have been more favorable for the evolution of increased virulence of airborne pathogens like influenza." He suggests several hypotheses for the heightened virulence of Spanish influenza.

First, the soldiers themselves served as "cultural vectors" for the passage of the 'flu. That is to say, "The people and vehicles transporting the infecteds and susceptibles to and from the trenches and hospitals are components of a cultural vector because they

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17Eigen and Winkler-Oswatitsch, Steps Towards Life, p. 98.

18Ibid., p. 99. Eigen insists that his concept of the viral quasispecies represents more than an exercise in theoretical schematics. He cites the work of Simon Wain Hobson on HIV at the Pasteur Institute as confirmation that viruses, in laboratory experiments, do respond to evolutionary pressures as quasispecies. See "Viral Quasispecies," pp. 45-46. And note once again the difficulty of representing the mindlessness of evolutionary change--influenza virus particles do not "scan" anything, but succeed (or fail) in replicating themselves, and the course and severity of an infection (or epidemic or pandemic) is decided by those that succeed.

19See his Evolution of Infectious Disease, p. 110.
permit transmission from an immobilized person to susceptibles." In this scenario, influenza ceased to be merely an airborne pathogen by gaining the use of a vector, as malaria and yellow fever employ different species of mosquito. Precisely because it no longer mattered whether influenza's victims lived or died (the disease could find new hosts with equal ease and speed in either case), its virulence was correspondingly enhanced.

Second, Ewald considers the "rapid transfer" hypothesis, in which influenza develops greater virulence not because of a new found vector, but because "Transfer soon after the onset of infection selects for those pathogen variants that reproduce rapidly and early during the infection. . . ." In this case, crowding along the western front in late summer 1918 permitted an airborne disease to achieve heightened virulence through an unprecedented velocity of transmission.

Finally, he briefly examines the effect that the origin of the virus may have exercised upon its virulence. Citing a recent study that has shown " . . . that human and swine strains [of influenza] had a common ancestor during the second decade of the twentieth century," Ewald doubts that swine were the source for the pandemic, concluding that " . . . there is no evolutionary basis for supposing that transmission from swine to

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20Ibid., p. 112.

21Ibid., p. 115. This appears to have occurred during an influenza epizootic among chickens in Pennsylvania in 1983— an H5 strain of flu so virulent that it resembled a strain of Ebola virus, raced through factory-held birds, resulting in the death or destruction of approximately 17 million chickens. See Ibid., p. 12, and Gladwell, "The Dead Zone," pp, 64-65.
humans should be associated with particularly high virulence in humans."^22

Here the historian can come to the aid of the biologist. Ewald is surely right to discount the swine 'flu theory; as noted above, there is no evidence of swine infection with the virus before August-September 1918. He is also correct to doubt the rapid-transfer hypothesis. The western front was never a uniform, monolithic structure, packed with infantry. Least of all was this the case in the summer and autumn of 1918, when the long sought war of movement was regained by the Allies in late July and its advantages never relinquished.

Ewald is correct in concluding, therefore, that "The hypothesis of war-enhanced virulence provides a more parsimonious explanation [for the pandemic's mortality]," but here he wields a more powerful argument than he realizes.^23 It was not the case, as Ewald claims, that "Soldiers in the trenches were grouped so closely that even immobile infecteds could transmit pathogens," for a commitment to defense in depth by the armies on both sides of the western front reduced troop concentrations among front line soldiers.^24

Despite the fact that la grippe maligne first appeared among French troops near the front lines, it was precisely these front line troops who suffered least from the pandemic--the

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^22Ewald, Evolution of Infectious Disease pp. 113-14. Ewald considers a fourth possibility, that the extraordinary mortality of 1918 was the result of "... simultaneous infection with the bacterium Hemophilus influenzae." (p. 114) This he dismisses for the reasons recorded above: too few victims of the 1918 pandemic gave evidence of H. influenzae infection at autopsy, and there exists no convincing explanation for why this bacterium should suddenly act in concert with influenza, nor why it should have become so virulent in its own right in the summer and autumn of 1918.

^23Ibid., p. 114.

^24Ibid., p. 110.
heavy losses within the Allied armies were concentrated in rear areas, among troops either in training or employed in the supply services. Moreover, Ewald takes no notice of the abnormally low death tolls in France as a result of the pandemic, and the cultural vectors hypothesis can explain these as well.

Hence, Eigen's work on the microevolution of viruses together with Ewald's research in evolutionary epidemiology provide models that should enable the historian to construct a coherent explanation for both the extraordinary virulence of Spanish influenza and the anomaly of reduced mortality recorded at the epicenter of infection in France.

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Drawing upon the emerging discipline of evolutionary epidemiology, a yoking of history with biology is needed to construct a coherent explanation for the mortality patterns of Spanish influenza in France. The investigation of such a hypothesis would

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25This interdisciplinary approach should be the more fruitful as microbiology is that science of which C. P. Snow wrote "There are few parts of the hard sciences of which one can understand so much without mathematical training." See The Two Cultures: And a Second Look. (Cambridge: Cambridge University Press, 1965), p. 73. Apparently it is not just historians who suffer a mathematics deficiency. The renowned geneticist Theodosius Dobzhansky wrote to one of the founders of population genetics, Sewall Wright, that he had "Just read (or tried to read?) your paper . . . I am delighted to see it although my mathematical understanding is far too insufficient to read and understand it completely. But I have done the same thing that I have with other papers: read the part of the text preceding and following the mathematics, skipped the latter in assurance that to it the expression "papa knows how" is applicable." (Quoted in Peter J. Bowler, The Norton History of the Environmental Sciences. [New York: W. W. Norton & Company, 1993], pp. 470-71.)

The best general introduction to evolutionary medicine, co-authored by one of the founders of the field, is Randolph M. Nesse and George C. Williams, Why We Get Sick:
demonstrate that wartime conditions enabled France to export the Spanish 'flu and so reduce the number of its French victims. However, after almost eighty years of sometimes intensive investigation, it seems unlikely that Spanish influenza will surrender all of its secrets to a simple explanation, no matter how clever the science, nor how thorough the historical research. Moreover, the hypothesis requires no leap of faith, employs no deus ex machina to arrive at its conclusion. Too often in the years since 1918, researchers frustrated by the seemingly random pattern of the pandemic's eruptions around the globe have had resort to bizarre expedients by way of explanation. So in the 1920s F. G. Crookshank reopened the investigation of the part that the "epidemic constitution" and magnetic disturbances may have played during the pandemic. Almost fifty years later, Crosby, for lack of a plausible alternative, endorsed the view that the extraordinary mortality of the pandemic was probably the result of a synergistic relationship between influenza and the bacterium Hemophilus influenzae—despite the fact that this conclusion violates Koch's Postulates.26

26See F. G. Crookshank, Epidemiological Essays. (New York: The Macmillan Company, 1931), pp. 49-55, and "The Theory of Influenza," in F. G. Crookshank, ed., Influenza: Essays by Several Authors. (London: William Heinemann (Medical Books) Ltd., 1922), pp. 459-65; and Crosby, America's Forgotten Pandemic: The Influenza of 1918, pp. 301-03. Chapter 2 will deal more fully with these ideas. Koch's Postulates are named for the German bacteriologist, Robert Koch (1843-1910), who devised them as a test for the establishment of a direct link between a specific bacterium and a specific disease: 1) The suspected antigen must be found in every case of the disease; 2) it must be grown in pure culture; 3) the culture must reproduce the same symptoms previously observed when introduced into experimental animals; and 4) from
The hypothesis that is now needed, by contrast, would require no such ventures into speculation, but rather would employ a quantitative analysis to illustrate a direct, operative link between the influenza virus and its human hosts, and so provide an example of how these act upon each other as influenza moves through a human population. In so doing, such a study would put the counterintuitive case. Jay Winter has written that "... the evidence we have presented of the huge toll of lives taken by the influenza epidemic in a country [Sweden] far removed from the battle fronts helps establish the case that the war.

these animals the antigen once again must be isolated in pure culture.


To abandon Koch's guidelines, whose simplicity and rigor has contributed so much to bacteriology and virology over the past century, amounts to throwing out the baby with the bath water, the more so as the violation of the Postulates is unnecessary. To his credit, Edwin O. Jordan stuck to science and concluded that "... we are forced to accept the hypothesis of a change in the virulence of the infecting microbe as the essential cause of the rise and fall of pandemic influenza." See his *Epidemic Influenza: A Survey*, p. 511. Note that as the influenza virus was not isolated until 1933 (i.e., six years after Jordan published), Jordan could not have known the exact nature of the "infecting microbe."

The results of the analysis will be depicted in a set of time-series diagrams, for which see Edward R. Tufte, *The Visual Display of Quantitative Information*. (Cheshire CT: Graphics Press, 1983), pp. 40-41. On page 41, Tufte reproduces Charles Minard's graphic illustrating the losses suffered by Napoleon's army during its advance on and retreat from Moscow in 1812, and adds "It may well be the best statistical graphic ever drawn." (p. 40)

Time-series diagrams are especially useful as they permit the representation of a number of variables in a spatial dimension, variables which in this study will include time, direction and velocity of infection, traffic densities along rail lines and roadways in France (as well as into and out of French ports on the Atlantic and Channel coasts), and morbidity and mortality rates.
had little or nothing to do with the ravages of this killer disease." Here, however, he falls prey to a common fallacy, that war unfailingly exacerbates human problems of all sorts. By contrast, further study would demonstrate that the peculiar conjunction of the war and the pandemic saved tens of thousands of French lives.

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CHAPTER 5
CONCLUSION

The epidemics of 20th century western world have been those of aging (heart disease, many cancers, Alzheimer’s disease) or niche diseases (AIDS, adolescent polio, sickle-cell anemia). Epidemics such as malaria, tuberculosis, and infantile diarrhoea continue to ravage nations in the developing world, as they have for centuries. Yet the only widespread epidemic of the 20th century west, and the only truly pandemic disease in history, has been influenza.

Indeed, the two lone infectious diseases to cross the first world/third world divide in force in the twentieth century have been influenza and AIDS. Different strains of tuberculosis exist on either side of the divide, and the "emerging viruses" (Ebola, Marburg disease and Hanta virus, for example) have as yet caused far more alarm than disease. Older epidemic diseases have become historical curiosities in the west--literally so, as their imprints remain on the historical record, and each has become a thriving cottage industry crawling with historians and historical epidemiologists. Yet judged by absolute mortality, influenza, with the murkiest history and microbiology of all epidemic diseases, has for over 150 years been the most potent infectious epidemic disease of the west.
Given the sheer number of its victims, then, why the paucity of historical documentation about the Spanish 'flu? First, the lack of depth in the historical record reflects the broad and shallow nature of the mortality of influenza—hence, the dearth of historical records in France, and elsewhere, for 1918. In this way, influenza more resembles venereal diseases than other infectious epidemics, but without the easy opportunities for class distinction and moral opprobrium, nor the comparatively narrow population and sex cohort. If cholera or yellow fever resemble a car crash in which authorities tape off, examine and record the wreckage while passers-by rubberneck, an influenza breakout more closely resembles a flood—every man for himself, including the authorities, with everyone inconvenienced but comparatively few deaths. After all, one does not speak of a "visitation" of 'flu as one would of cholera or plague.

Further, people in 1918 understood 'flu differently than do we, with our statistical capacity complemented by sophisticated microbiology. The Spanish 'flu was immediately forgotten not because it was simply another epidemic in a short list; rather, it did not fit the short list of illnesses such as cholera, yellow fever, typhoid fever and smallpox, all of which had left innumerable marks on the nineteenth century. Moreover, as the Spanish 'flu vanished from the population as quickly as it had descended upon it, so the jarring realities of the disease disappeared into the recesses of a population's collective memory amid the post-war rebuilding and an astonishing cultural transformation heralded by
scientific and medical breakthroughs that had begun some years before the war and which ended in the mid-twentieth century.

The hubris accompanying war-time medical progress was evident at a session of the The Interallied Surgical Conference for the Study of War Wounds held in July 1920, in which Médecin Inspecteur-Général Joseph-Henri Toubert boasted that "Enemy fire claimed six to seven times more victims than disease. This is a phenomenon unique in the history of warfare. It demonstrates at once the essential role of surgery and that of medicine in the course of the war of 1914-1918."¹ The numerical disparity between casualties inflicted by enemy action and those the result of disease during the Great War surely represented an unexpected development in the history of warfare. (Nevertheless, one ought be forgiven the suspicion that this figure had less to do with the advance of medicine than with a newfound European industrial capacity for organized mayhem.² Indeed, the western front represented a new--and durable--construct in European, even

¹The emphasis is Toubert's. See his, Étude statistique des pertes subies par les Français pendant la guerre, 1914-1918: Progrès accompli dans le fonctionnement du Service de santé pendant la guerre. (Paris: Charles Lavauzelle & Cie., 1921), p. 36. Toubert's calculation was based upon a finding that 175,000 French soldiers died of disease during the course of the war.

²Twice as many soldiers died of disease as of enemy fire in both the Franco-Prussian War and the Russo-Turkish War of 1877. The preponderance of disease deaths in the Crimean War was even greater. See Dopter, Les maladies infectieuses pendant la guerre: étude épidémiologique, p. 2.
world, history. Never before had so many people been maintained in such a restricted
space with so little useful work to do over so long a span of time, their health as good as
their luck and the misery of their diurnal round permitted, in order they be preserved for
industrialized destruction.  

Paddy Griffith notes that the western front—with the exception of the
Birmingham-Liverpool-Manchester triangle—could only have appeared where it
did: "In crude industrial terms, there could not possibly have been a better place to
fight a war than the very rich border area between Belgium, northeastern France
and central western Germany, which was the economic 'golden triangle' from
which the European Common Market would eventually emerge." See his Battle
Tactics on the Western Front, p. 31.

The western front was new because never before had any state the ability
to maintain millions of men and draft animals in one place without requiring the
men and animals to spend all of their time foraging for food. As recently as 1870
this had been impossible: "When [German] operations came to a halt, as they did
during the sieges of Metz and Paris, very great supply difficulties were at once
experienced. . . . In the case of Paris, it was necessary virtually to suspend the
military functions of the army for the duration of two months and have the troops
look after their provisions instead." (Van Creveld. Supplying War: Logistics from
Wallenstein to Patton, p. 108)

The ability of the European powers to employ railways to transport bulk
provisions, however, came to ashes; the western front ground into stalemate
because there was a missing link in the line of supply, recognized long ago: "The
men slogged along on foot once they reached railhead. Hence the extraordinary
contrast of the war: fast in delivering men to the battlefield; slow when they got
there. The armies could move no faster than in Napoleon's time or in the time of
the Romans when it came to fighting. Indeed, they could not move as fast. For
reinforcements could always arrive by rail to a threatened position before the
attacking side could break through on foot. Railway trains go faster than men
walking. This is the strategical reason why the defence was stronger than the
attack throughout the First World War. Defence was mechanized; attack was

Yet the problem was even more acute than this—armies did not merely
slow to a crawl upon exiting their trains, but were getting slower all the time: " . . .
Along with the technical progress in the delivery of consumer goods, and no less striking in its effects, came the establishment of the authority and usefulness of scientific medicine. But the process required time. Running roughly from 1880 to 1955, from the first successes in understanding the aetiology of infectious disease (tuberculosis, anthrax, rabies) through the discovery of antibiotics, and on to the conclusion of the campaign to create a polio vaccine, the watershed proved to be the antibiotic revolution which commenced in the 1930s with the introduction of sulpha drugs and which reached high tide with the first generation of antibiotics in the 1940s and 1950s, when western peoples passed over the great divide by achieving a defense against an array of bacterial infections.

the so-called critical distance, the maximum one at which a force could operate away from its railhead, was actually falling during the period [1860-1914] under discussion. By the early twentieth century, the 100 miles of the 1860s had fallen to about half that number. . . . To exacerbate the problem, in 1914 the combat troops of a corps took up so much road--twenty miles or more--that the transport companies often found it difficult to reach them in one day's march. A corps, in other words, was getting so big that it was difficult to keep it supplied even when it was not advancing at all! To this extent the mobility of armies had declined relative to their bulk during the years leading to World War I." (Van Creveld, *Supplying War: Logistics from Wallenstein to Patton*, p. 113)

The western front has remained a durable model in western history because so many and varied uses have been found for it. Indeed, the western front was the first non-riparian "edge" or "strip" city in history. What is more, the western front was the largest metropolis yet to appear on the planet--in 1916, the population on both sides of the front amounted to over six million.
Now, only eight decades removed from the pandemic and the first World war, we exist beyond that great divide in disease experience, and in so many other areas: the quantity and quality of our diets, the types of work we do, our personal hygiene, the extent and nature of our leisure. Our foods are grown and slaughtered by proxy. We live amid a ubiquity of synthetic, hermetically-sealed consumer goods. No longer are our suits brushed for dust or our streets doused for dust; no longer is our milk boiled as soon as bought. Indeed, we have so sanitized our lives that we have lost the power to connect intelligibly with the past.

Hence, another reason the Spanish 'flu was forgotten in the eighty years since its sudden appearance and disappearance is that narrative history has been discounted. Discounted not only because we have good reason to distrust its ability to represent real life (narrative history tells lies because it must—it could hardly do else; history is not a narrative). Narrative history has been discounted, at least in part, not because it fails to tell us what we want to know, nor entirely because we have good reason to distrust its ability to represent real life, but because we no longer understand the material, the story, the circumstances of the narrative.

This lapse is only one aspect of the extent to which the west has separated itself, from both the rest of the (third) world and from its own history. Now, however, as we are confronted with auto-immune diseases, retroviruses and antibiotic-resistant strains of
bacteria, we have finally begun to learn that germs were, and still are, the stars of this revolution. And if we are forced to recross the great divide by the spread of bacterial resistance and the emergence of yet more dangerous viral infections—what then? What if, consequently, our infant mortality rate surges, our longevity is diminished, and our obsession with personal hygiene seems but another manifestation of a pampered and narcissistic age? No doubt we will yet be unable to recover the frightened and humbled respect of our ancestors for epidemics of infectious disease.
BIBLIOGRAPHY

PRIMARY SOURCES:


ARCHIVAL SOURCES:

* Fermeture des théâtres, cinémas par mesure d'hygiène (5M122)
* Hopitaux militaires ou formations sanitaires (5M122)
* Bulletins confidentiels (5N268)

Archives Départementales de la Gironde:

* Rapports mensuels (1M415)
* Bulletins hebdomadaires (1M413)
* Telegrammes (1M410)
* Rapport sur les épidémies qui ont sévi dans le
  Département de la Gironde en 1916 (5M114)
* Dépèche télégraphique officielle (5M122)
* Correspondance (5M122)
* Rapports mensuels (1M415)

Château de Vincennes:

* Service historique de l'armée de terre.
* Services historique de l'armée de terre.
* Opérations des Commissions de congés de convalescence (7N546)
* L'état de l'opinion en France d'après le contrôle
  de la correspondance.(7N955)

BOOKS:


ARTICLES:


Roberts, R.S. "Epidemics and Social History." *Medical History*, v. xii, no. 3 (July 1968): pp. 305-16.
